MECHANICAL SYMBOLS LIST

AC-1 / TXF-1	EQUIPMENT SYMBOL
XX / X	RISER SYMBOL
AIR DEVICES	
	SUPPLY GRILL
	RETURN GRILL
	LINEAR DIFFUSER SUPPLY – SIDEWALL
	LINEAR DIFFUSER RETURN – SIDEWALL
DUCT ACCESSORIES	
GD	GRAVITY DAMPER
	FIRE DAMPER W/ ACCESS DOOR
M	MOTORIZED DAMPER W/ ACCESS DOOR
VD VD	VOLUME DAMPER W/ ACCESS DOOR
UC	DOOR UNDERCUT
HVAC PIPING	
CP	NEW CONDENSATE PIPING
REF	NEW REFRIGERANT PIPING
CONTROLS AND SENSORS	
T	THERMOSTAT
T_S	TEMPERATURE SENSOR
DUCTWORK	
	AIR DUCT W/ 1.5" ACOUSTICAL LINING
	FLEXIBLE DUCT
FC FC	FLEXIBLE CONNECTION
24X12	RECTANGULAR DUCT (WIDTH X DEPTH)
ø12	ROUND DUCT (DIAMETER)
	ROUND DUCT CROSS SECTION
	SUPPLY AIR RECTANGULAR DUCT CROSS SECTION
	RETURN AIR RECTANGULAR DUCT CROSS SECTION

CODE COMPLIANCE

ALL WORK AND MATERIAL SHALL BE PERFORMED AND INSTALLED IN COMPLIANCE WITH THE FOLLOWING CODES AS ADOPTED AND AMENDED BY THE CITY OF TALLHASSEE. NOTHING IN THESE DRAWINGS IS TO BE CONSTRUCTED TO PERMIT WORK NOT CONFORMING TO THESE CODES OR OTHERS APPLICABLE TO THESE PROJECT:

- 2023 FLORIDA BUILDING CODE – 8TH EDITION.
- 2023 FLORIDA MECHANICAL CODE– 8TH EDITION.
- 2023 FLORIDA PLUMBING CODE – 8TH EDITION.
- 2020 NATIONAL ELECTRICAL CODE (NFPA 70).
- 2023 FLORIDA ENERGY CONSERVATION CODE – 8TH EDITION.
- 2023 FLORIDA FUEL GAS CODE – 8TH EDITION.

MECHANICAL DRAWING LIST

MECHANICAL ABBREVIATIONS

AHU	AIR HANDLING UNIT
ACCU	AIR COOLED CONDENSER UNIT
AL	ACOUSTIC LINING
GD	GRAVITY DAMPER
CFM	CUBIC FEET OF AIR PER MINUTE
C.O.	CLEAN OUT
COP	COEFFICIENT OF PERFORMANCE
CP	CONDENSATE PUMP
CR	CONDENSATE RETURN PIPING
CD	CONDENSATE DRAIN PIPE
DN	DOWN
EDH	ELECTRIC DUCT HEATER
EER	ENERGY EFFICIENCY RATIO
EUH	ELECTRIC UNIT HEATER
EG	EXHAUST GRILLE
EF	EXHAUST FAN
FD	FIRE DAMPER W/FUSIBLE LINK
HSPF	HEATING SEASONAL PERFORMANCE FACTOR
IEER	INTEGRATED ENERGY EFFICIENCY RATIO
MD	MOTORIZED DAMPER
OA	OUTDOOR AIR
REF	REFRIGERANT PIPING
RG	RETURN GRILLE
SAR	SUPPLY AIR REGISTER
SEER	SEASONAL ENERGY EFFICIENCY RATIO
SG	SUPPLY GRILLE
VD	VOLUME DAMPER
W.M.S.	WIRE MESH SCREEN
OAF	OUTSIDE AIR FAN
WT	WEIGHT
EX	EXHAUST RISER
SA	SUPPLY AIR RISER
RA	RETURN AIR RISER

FLORIDA BUILDING DEPARTMENT NOTES

ALL WORK SHALL COMPLY WITH APPLICABLE SECTIONS OF 2023 FLORIDA BUILDING CODE (FBC) AND ALL AMENDMENTS AND RULES AND REGULATIONS OF THE DEPARTMENT OF BUILDINGS TO DATE. THE LICENSED PROFESSIONAL ENGINEER, ARCHITECT OR OTHER PERSON HAVING NOT LESS THAN FIVE (5) YEARS EXPERIENCE SUPERVISING THE INSTALLATION OF SUCH MECHANICAL SYSTEMS AND CONDUCTING SUCH TESTS WILL FILE DOCUMENTATION AND REPORTS OF TESTS THAT THE SYSTEM COMPLIES WITH THE CONSTRUCTION DOCUMENTS AND APPLICABLE LAWS.

1. TESTS OF MECHANICAL SYSTEMS SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING SECTIONS OF THE 2023 FMC, 8TH EDITION:
   A. VENTILATION SYSTEM SERVING COMMERCIAL COOKING APPLIANCES – FMC 506
2. THE FOLLOWING WORK ITEMS, COMPONENTS, MATERIALS, CAPACITIES, ETC. SHALL COMPLY WITH THE REFERENCED CODE OR STANDARD:
   A. DUCT CONSTRUCTION AND INSTALLATION– 2023 FMC 603
   B. AIR INTAKES, EXHAUSTS AND RELIEF – 2023 FMC 401.5
   C. GAS FIRED EQUIPMENT –2023 FLORIDA FUEL GAS CODE
3. MINIMUM TEMPERATURE TO BE MAINTAINED IN OCCUPIED SPACES DURING HEATING SEASON: 68 DEG. FAHRENHEIT.
4. VENTILATION FOR ALL AREA SHALL COMPLY WITH 2023 FMC 401.
5. A STATEMENT SHALL BE FILED BY THE OWNER OR TENANT IN POSSESSION THAT THE VENTILATION SYSTEM WILL BE KEPT IN CONTINUOUS OPERATION AT ALL TIMES DURING THE NORMAL OCCUPANCY OF THE STRUCTURE AS REQUIRED BY 2023 FMC 403.3.1.3 (SYSTEM OPERATION)
6. REFER TO ARCHITECTURAL DRAWINGS FOR REQUIRED FIRE–RATED WALL AND SMOKE WALL CONSTRUCTION AND LOCATION.
7. THESE PLANS ARE APPROVED ONLY FOR THE WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE RELIED UPON OR TO BE CONSIDERED AS BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.
8. ALL HEATING AND COOLING LOADS CALCULATED PER ASHRAE/ACCA 183.
9. DUCT SMOKE DETECTOR SHALL MEET UL268A.
10. VENTILATION SYSTEMS SHALL BE BALANCED TO MAINTAIN THE MINIMUM VENTILATION AIRFLOW RATE AS SHOWN IN VENTILATION REQUIREMENT TABLE. THIS SYSTEM SHALL BE BALANCED BY APPROVED METHOD – FMC 2023 608.1. CONTRACTOR SHALL SUBMIT THE AIR BALANCE REPORT TO THE INSPECTOR.

SCOPE OF WORK

1. CONTRACTOR TO PROVIDE 3# 4–TON, 1# 2–TON & 1#1.5–TON SPLIT SYSTEMS CONSISTING OF OUTDOOR CONDENSING UNIT, FURNACE WITH EVAPORATOR COIL AIR HANDLERS WITH REQUIRED ACCESSORIES AND SUPPORTS.
2. PROVIDE 3# CEILING MOUNTED RESTROOM EXHAUST FANS WITH REQUIRED ACCESSORIES & SUPPORTS.
3. PROVIDE REQUIRED CONTROLS FOR ALL MECHANICAL EQUIPMENT, NEW DUCTWORK, DIFFUSERS/GRILLES WITH REQUIRED ACCESSORIES AND SUPPORTS AS SHOWN ON PLAN.
4. THE WORK UNDER CONTRACT INCLUDES ALL LABOR, MATERIALS AND APPLIANCES NECESSARY FOR THE FURNISHING, INSTALLING AND TESTING, COMPLETE AND READY FOR SAFE OPERATION OF THE SYSTEMS AS DESCRIBED IN THE SPECIFICATIONS, FLOOR PLAN(S) DESIGN, DETAIL DRAWINGS, NOTES, RFI'S, ETC. FOR THIS PROJECT. WORK SHALL BE INSTALLED IN A NEAT, WORKMANLIKE MANNER.
5. THE CONTRACTOR SHALL GIVE NECESSARY NOTICE, FILE DRAWINGS AND SPECIFICATIONS WITH THE DEPARTMENT HAVING JURISDICTION, OBTAIN PERMITS OR LICENSES NECESSARY TO CARRY OUT THIS WORK AND PAY ALL FEES THEREFORE. THE CONTRACTOR SHALL ARRANGE FOR INSPECTION AND TESTS OF ANY OR ALL PARTS OF THE WORK IF SO REQUIRED BY AUTHORITIES AND PAY ALL CHARGES FOR SAME. THE CONTRACTOR SHALL PAY ALL COSTS FOR, AND FURNISH TO THE OWNER BEFORE FINAL BILLING, ALL CERTIFICATES NECESSARY AS EVIDENCE THAT THE WORK INSTALLED CONFORMS WITH ALL REGULATIONS WHERE THEY APPLY TO THIS WORK.
6. THE CONTRACTOR SHALL FURNISH A WRITTEN GUARANTEE TO REPLACE OR REPAIR PROMPTLY AND ASSUME RESPONSIBILITY FOR ALL EXPENSES INCURRED FOR ANY WORKMANSHIP AND EQUIPMENT IN WHICH DEFECTS DEVELOP WITHIN ONE YEAR FROM THE DATE OF FINAL CERTIFICATE FOR PAYMENT AND/OR FROM DATE OR ACTUAL USE OF EQUIPMENT OR OCCUPANCY OF SPACES, BY OWNER, INCLUDED UNDER THE VARIOUS PARTS OF THE WORK, WHICHEVER DATE IS EARLIER. THIS WORK SHALL BE DONE AS DIRECTED BY THE OWNER. THIS GUARANTEE SHALL ALSO PROVIDE THAT WHERE DEFECTS OCCUR, THE CONTRACTOR WILL ASSUME RESPONSIBILITY FOR ALL EXPENSES INCURRED IN REPAIRING AND REPLACING WORK OF OTHER TRADES AFFECTED BY DEFECTS, REPAIRS OR REPLACEMENTS IN EQUIPMENT SUPPLIED BY THE CONTRACTOR.

GENERAL NOTES

1. CONTRACTOR SHALL SURVEY THE AREA OF THIS WORK BEFORE SUBMITTING A BID AND SHALL BE RESPONSIBLE FOR NOTIFYING THE ARCHITECT OF ANY CONDITIONS WHICH WOULD PREVENT THE INSTALLATION OF THE WORK AS SHOWN ON DRAWINGS.
2. ALL APPLICABLE CODES, LAWS AND REGULATIONS GOVERNING OR RELATING TO ANY PORTION OF THIS WORK ARE HEREBY INCORPORATED INTO AND MADE A PART OF THESE SPECIFICATIONS, AND THEIR PROVISIONS SHALL BE CARRIED OUT BY THE CONTRACTOR WHO SHALL INFORM THE OWNER, PRIOR TO SUBMITTING A PROPOSAL, OF ANY WORK OR MATERIALS WHICH VIOLATE ANY OF THE ABOVE LAWS AND REGULATIONS. ANY WORK DONE BY THE CONTRACTOR CAUSING SUCH VIOLATION SHALL BE CORRECTED BY THE CONTRACTOR.
3. BEFORE PROCEEDING WITH ANY WORK IN OCCUPIED OR USED AREAS, THE CONTRACTOR SHALL APPLY TO OWNER FOR PERMISSION TO ENTER SUCH AREAS. THE CONTRACTOR IS OBLIGED TO PERFORM HIS WORK ONLY AT THE TIMES DESIGNATED BY OWNER. THERE WILL BE NO ADDITIONAL COMPENSATION FOR THE WORK PERFORMED AFTER HOURS OR ON OFF–DAYS WITHOUT PRIOR WRITTEN APPROVAL.
4. THE WORK IN THE BUILDING SHALL BE DONE WHEN AND AS DIRECTED, AND IN A MANNER SATISFACTORY TO THE OWNER. THE WORK SHALL BE PERFORMED SO AS TO CAUSE THE LEAST POSSIBLE INCONVENIENCE AND DISTURBANCE TO THE PRESENT OCCUPANTS.
5. THE CONTRACTOR'S PROPOSAL FOR ALL WORK SHALL BE PREDICATED ON THE PERFORMANCE OF THE WORK DURING REGULAR WORKING HOURS. WHEN SO DIRECTED, HOWEVER, THE CONTRACTOR SHALL INSTALL WORK IN OVERTIME AND THE ADDITIONAL COST TO BE CHARGED THEREFORE SHALL BE ONLY THE "PREMIUM" PORTION OF THE WAGES PAID.
6. CONTRACTOR SHALL ASCERTAIN THE APPROPRIATE METHOD FOR BRINGING THE UNITS INTO AND THROUGH THE BUILDING TO POSITION UNIT IN LOCATION SHOWN ON THE PLANS. WHERE NECESSARY, EQUIPMENT SHALL BE SHIPPED FROM MANUFACTURER IN SECTIONS OF SIZE SUITABLE FOR MOVING THROUGH RESTRICTIVE SPACES. COORDINATE WITH BUILDING OWNER APPROPRIATE TIMES OF DAY SUCH EQUIPMENT MAY BE MOVED THROUGH ALL AREAS.
7. DUCTWORK AND PIPING IS SHOWN DIAGRAMMATICALLY AND DOES NOT SHOW ALL OFFSETS, DROPS AND RISES OF RUNS. THE CONTRACTOR SHALL MAKE ALLOWANCE IN PRICING FOR ROUTING OF DUCTWORK AND PIPING TO AVOID OBSTRUCTIONS. EXACT LOCATIONS ARE SUBJECT TO APPROVAL OF ARCHITECT. COORDINATION WITH THE EXISTING SERVICES, INCLUDING THOSE OF OTHER TRADES IS REQUIRED.
8. SUPPORT ALL DUCTWORK AND PIPING FROM BUILDING STRUCTURE AND/OR FRAMING IN AN APPROVED MANNER. WHERE OVERHEAD CONSTRUCTION DOES NOT PERMIT FASTENING OR SUPPORTS FOR EQUIPMENT, FURNISH ADDITIONAL FRAMING. INSERTS SHALL BE STEEL, SLOTTED TYPE AND FACTORY PAINTED. SINGLE ROD SHALL BE SIMILAR TO GRINNELL FIG. 281. MULTI–ROD SHALL BE SIMILAR TO FEE & MASON SERIES 9000 WITH END CAPS AND CLOSURE STRIPS. MAXIMUM LOADING INCLUDING PIPES, DUCTWORK CONTENTS AND COVERING SHALL NOT EXCEED 75% OF RATED INSERT CAPABILITY. WHEN SUPPORTING FROM BUILDING USE BEAM CLAMPS IN APPROVED MANNER.
9. PROVIDE ALL NECESSARY FLASHING AND COUNTER FLASHING TO MAINTAIN THE WATERPROOFING INTEGRITY OF THIS BUILDING AS REQUIRED BY THE INSTALLATION OR REMOVAL OF PIPES, DUCTS, LOUVERS, CONDUIT, AND EQUIPMENT. PROVIDE EQUIPMENT CURBS AND DUNNAGE STEEL AS REQUIRED.
10. SEAL OPENINGS AROUND DUCTS AND PIPING THROUGH PARTITIONS, WALLS AND FLOORS (NOT IN SHAFTS) WITH MINERAL WOOL OR OTHER NONCOMBUSTIBLE MATERIAL (FIBERGLASS INSULATION IS NOT ACCEPTABLE).
11. WHERE PENETRATIONS THROUGH FIRE RATED WALLS ARE NOT FIRE PROOFED THIS CONTRACTOR SHALL BE RESPONSIBLE TO SEAL SAME TO MAINTAIN THE RATED INTEGRITY.
12. INSTALL WORK SO AS TO BE READILY ACCESSIBLE FOR OPERATION, MAINTENANCE AND REPAIR. MINOR DEVIATIONS FROM DRAWINGS MAY BE MADE TO ACCOMPLISH THIS, BUT CHANGES WHICH INVOLVE EXTRA COST SHALL NOT BE MADE WITHOUT APPROVAL.
13. ACCESS DOORS ARE REQUIRED FOR ALL BUILDING SERVICE VALVES THAT RUN THROUGH THE SPACE, AND ACCESS DOOR SHALL HAVE THE EQUAL RATED CAPACITY (1HR, 2HR, ETC.) AS WALL. COORDINATE ALL LOCATIONS OF ACCESS DOORS WITH THE ARCHITECT.
14. REMOVABLE ACCESS TILE AND/OR ACCESS DOOR ARE REQUIRED IN HUNG CEILINGS, SHAFTS AND WALLS FOR ALL VOLUME AND FIRE DAMPERS, AUTOMATIC DAMPERS AND ALL OTHER MECHANICAL EQUIPMENT AND DEVICES. HVAC CONTRACTOR TO FURNISH ACCESS LOCATION REQUIREMENTS TO GENERAL CONTRACTOR. ACCESS TILE IDENTIFICATION: PROVIDE BUTTONS, TABS, AND MARKERS TO IDENTIFY LOCATION OF CONCEALED VALVES, DAMPERS AND EQUIPMENT.
15. THE CONTRACTOR SHALL KEEP ALL EQUIPMENT AND MATERIALS, AND ALL PARTS OF THE BUILDING, EXTERIOR SPACES AND ADJACENT STREETS, SIDEWALKS AND PAVEMENTS, FREE FROM MATERIAL AND DEBRIS RESULTING FROM THE EXECUTION OF THIS WORK. EXCESS MATERIALS WILL NOT BE PERMITTED TO ACCUMULATE EITHER ON THE INTERIOR OR THE EXTERIOR.
16. UNLESS OTHERWISE SPECIFICALLY SPECIFIED, INCLUDE ALL CUTTING AND PATCHING OF EXISTING FLOORS, WALLS, PARTITIONS AND OTHER MATERIALS IN THE EXISTING BUILDING. THE CONTRACTOR SHALL RESTORE THESE AREAS TO ORIGINAL CONDITION.
17. MATERIALS AND WORKMANSHIP, UNLESS OTHERWISE NOTED, SHALL BE IN ACCORDANCE WITH BUILDING STANDARDS.
18. ALL EQUIPMENT SHALL BE PROVIDED WITH ONE YEAR WARRANTY PARTS AND LABOR AND FIVE YEARS ON COMPRESSORS. WARRANTY PERIOD BEGINS UPON PROJECT ACCEPTANCE
19. ALL MATERIAL AND EQUIPMENT TO BE NEW UNLESS OTHERWISE NOTED AND SHALL BE IN ACCORDANCE WITH BUILDING STANDARDS.
20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR HIS WORK WITH TS COMPLETION AND FINAL ACCEPTANCE AND SHALL REPLACE ANY OF THE SAME WHICH MAY BE DAMAGED, LOST, OR STOLEN WITHOUT ADDITIONAL COST TO THE OWNER.
21. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FAILURE OF ANY DUCTWORK SYSTEM OR EQUIPMENT TO FUNCTION PROPERLY UPON COMPLETION OF HIS WORK UPON SAID SYSTEM OR EQUIPMENT.
22. SUBMIT SHOP DRAWING OF ALL WORK WHICH MUST BE APPROVED BY THE ARCHITECT AND ENGINEER BEFORE WORK COMMENCES.
23. SUBMISSION OF A PROPOSAL SHALL BE CONSTRUED AS EVIDENCE THAT A CAREFUL EXAMINATION OF THE PORTIONS OF THE EXISTING BUILDING, EQUIPMENT, ETC., WHICH AFFECT THIS WORK, AND THE ACCESS TO SUCH SPACES, HAS BEEN MADE AND THAT THE CONTRACTOR IS FAMILIAR WITH EXISTING CONDITIONS AND DIFFICULTIES THAT WILL AFFECT THE EXECUTION OF THE WORK. LATER CLAIMS SHALL NOT BE MADE FOR LABOR, EQUIPMENT OR MATERIALS REQUIRED BECAUSE OF DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN DURING SUCH AN EXAMINATION. THE ON–SITE INSPECTION SHALL VERIFY EXISTING DUCTWORK, PIPING (SIZES, CLEARANCES, ETC) AND CONDITIONS.
24. INSURANCE: IN ACCORDANCE WITH BUILDING REQUIREMENTS THE CONTRACTOR SHALL INCLUDE A HOLD HARMLESS CLAUSE FOR OWNER AND ENGINEER.
25. THE FINAL ACCEPTANCE WILL BE MADE AFTER THE CONTRACTOR HAS ADJUSTED HIS EQUIPMENT, BALANCED THE VARIOUS SYSTEMS, DEMONSTRATED THAT IT FULFILLS THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS AND HAS FURNISHED ALL THE REQUIRED CERTIFICATES OF INSPECTION AND APPROVAL.
26. SPECIFICATIONS ARE OF SIMPLIFIED FORM AND INCLUDE INCOMPLETE SENTENCES. WORDS OR PHRASES SUCH AS "THE CONTRACTOR SHALL," "SHALL BE," "FURNISH," "PROVIDE," "A," "THE," AND "ALL" HAVE BEEN OMITTED FOR BREVITY.
27. WHERE A CONFLICT EXISTS BETWEEN THE DRAWINGS, THE SPECIFICATIONS OR ANY OTHER CONSTRUCTION DOCUMENT, THE ONE WITH THE MOST STRINGENT REQUIREMENT(S) SHALL APPLY.

DEFINITIONS:

1) "PROVIDE": TO SUPPLY, INSTALL AND CONNECT UP COMPLETE AND READY FOR SAFE AND REGULAR OPERATION THE PARTICULAR WORK REFERRED TO UNLESS SPECIFICALLY OTHERWISE NOTED.
2) "INSTALL": TO ERECT, MOUNT AND CONNECT COMPLETE WITH RELATED ACCESSORIES.
3) "FURNISH" OR "SUPPLY": TO PURCHASE, PROCURE, ACQUIRE AND DELIVER COMPLETE WITH RELATED ACCESSORIES.

GENERAL HVAC NOTES

1. PROVIDE ALL MATERIAL AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
2. CONTRACT DOCUMENT DRAWINGS FOR MECHANICAL WORK (HVAC, PLUMBING, AND FIRE PROTECTION) ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.
3. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT FIXED BY DIMENSIONS ARE APPROXIMATE ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
4. WHEN MECHANICAL WORK (HVAC, PLUMBING, SHEET METAL, FIRE PROTECTION, ETC.) IS SUBCONTRACTED, IT SHALL BE THE MECHANICAL CONTRACTOR'S RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT, IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
5. COORDINATE CONSTRUCTION OF ALL MECHANICAL WORK WITH ARCHITECTURAL, STRUCTURAL, CIVIL, ELECTRICAL WORK, ETC., SHOWN ON OTHER CONTRACT DOCUMENT DRAWINGS.
6. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
7. WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF EQUIPMENT ARE REQUIRED, THE PRODUCT OF ONE MANUFACTURER SHALL BE USED.
8. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURERS' CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION.
9. ALL CONTROL WIRE AND CONDUIT SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE AND ELECTRICAL DIVISION OF THE SPECIFICATION.
10. PROVIDE VIBRATION ISOLATION FOR ALL MECHANICAL EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.
11. PROVIDE VIBRATION ISOLATORS FOR ALL PIPING SUPPORTS CONNECTED TO, AND WITHIN 50 FT. OF, ISOLATED EQUIPMENT
12. MAINTAIN A MINIMUM 6'–8" CLEARANCE TO THE UNDERSIDE OF PIPES, DUCTS, CONDUITS, SUSPENDED EQUIPMENT, ETC., THROUGHOUT ACCESS ROUTES IN MECHANICAL ROOMS.
13. LOCATE ALL TEMPERATURE, PRESSURE, AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH THE STRAIGHT SECTION OF PIPE OR DUCT UP– AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER FOR GOOD ACCURACY.
14. ALL MECHANICAL ROOM DOORS SHALL BE A MINIMUM OF 4'–0" WIDE.
15. WHERE BEAMS ARE INDICATED TO BE PENETRATED WITH DUCTWORK OR PIPING, COORDINATE DUCTWORK AND PIPING LAYOUT WITH BEAM OPENING SIZE AND OPENING LOCATIONS. COORDINATION SHALL BE DONE PRIOR TO THE FABRICATION OF DUCTWORK, CUTTING OF PIPING, OR FABRICATION OF BEAMS.
16. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN THE DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT (UNLESS OTHERWISE NOTED) SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR.
17. PROVIDE ACCESS PANELS FOR INSTALLATION IN WALLS AND CEILINGS, WHERE REQUIRED, TO SERVICE DAMPERS, VALVES, SMOKE DETECTORS, AND OTHER CONCEALED MECHANICAL EQUIPMENT. ACCESS PANELS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR FOR INSTALLATION. ACCESS PANELS SHALL HAVE THE EQUAL RATED CAPACITY (1HR, 2HR, ETC.) AS WALL.
18. MECHANICAL EQUIPMENT, DUCTWORK, AND PIPING SHALL NOT BE SUPPORTED FROM A METAL DECK.
19. ALL EQUIPMENT, PIPING, DUCTWORK, ETC., SHALL BE SUPPORTED AS DETAILED, SPECIFIED AND REQUIRED TO PROVIDE A VIBRATION–FREE INSTALLATION.
20. ALL DUCTWORK, PIPING, AND EQUIPMENT SUPPORTED FROM STRUCTURAL STEEL SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR. ALL ATTACHMENTS TO STEEL BAR JOISTS, TRUSSES, OR JOIST GIRDERS SHALL BE AT PANEL POINTS. PROVIDE BEAM CLAMPS MEETING MSS STANDARDS. WELDING TO STRUCTURAL MEMBERS SHALL NOT BE PERMITTED. THE USE OF C–CLAMPS SHALL NOT BE PERMITTED.
21. ALL ROOF–MOUNTED EQUIPMENT CURBS FOR EQUIPMENT PROVIDED BY THE MECHANICAL CONTRACTOR SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR AND INSTALLED BY THE GENERAL CONTRACTOR.
22. LOCATIONS AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS SHALL BE COORDINATED WITH ALL OTHER TRADES INVOLVED.
23. ALL OPENINGS IN FIRE WALLS DUE TO DUCTWORK, PIPING, CONDUIT, ETC., SHALL BE FIRE STOPPED WITH A PRODUCT SIMILAR TO 3M OR APPROVED EQUAL.

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MECHANICAL SYMBOLS, ABBREVIATIONS AND NOTES

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24. ALL AIR CONDITIONING CONDENSATE DRAIN LINES FROM EACH UNIT SHALL BE PIPED FULL SIZE OF THE UNIT DRAIN OUTLET, WITH "P" TRAP, AND PIPED TO THE NEAREST DRAIN. SEE THE DETAILS SHOWN IN THE DRAWINGS OR THE CONTRACT SPECIFICATIONS FOR THE DEPTH OF THE AIR CONDITIONING CONDENSATE TRAP.

25. REFER TO TYPICAL DETAILS FOR DUCTWORK, PIPING, AND EQUIPMENT INSTALLATION.

26. REINFORCEMENT, DETAILING, AND PLACEMENT OF CONCRETE SHALL CONFORM TO ASTM 315 AND ACI 318. CONCRETE SHALL CONFORM TO ASTM C94. CONCRETE WORK SHALL CONFORM TO ACI 318 PART ENTITLED "CONSTRUCTION REQUIREMENTS".COMPRESSIVE STRENGTH IN 28 DAYS SHALL BE 3,000 PSI. TOTAL AIR CONTENT OR EXTERIOR CONCRETE SHALL BE BETWEEN 5 AND 7 PERCENT BY VOLUME. SLUMP SHALL BE BETWEEN 3 AND 4 IN. CONCRETE SHALL BE CURED FOR 7 DAY AFTER PLACEMENT.

27. CONCRETE HOUSEKEEPING PADS TO SUIT MECHANICAL EQUIPMENT SHALL BE SIZED AND LOCATED BY THE MECHANICAL CONTRACTOR. MINIMUM CONCRETE PAD THICKNESS SHALL BE 6 IN. PAD SHALL EXTEND BEYOND THE EQUIPMENT A MINIMUM OF 6 IN. ON EACH SIDE. CONCRETE HOUSEKEEPING PADS SHALL BE PROVIDED BY THE GENERAL CONTRACTOR. IT SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR TO COORDINATE THE SIZE AND LOCATION OF CONCRETE HOUSEKEEPING PADS WITH THE GENERAL CONTRACTOR.

28. ALL TESTS SHALL BE COMPLETED BEFORE ANY MECHANICAL EQUIPMENT OR PIPING INSULATION IS APPLIED.

29. TESTING, ADJUSTING, AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). TESTING, ADJUSTING, AND BALANCING SHALL BE PERFORMED IN ACCORDANCE WITH THE AABC STANDARDS.

HVAC DUCTWORK – SHEET METAL

1. CERTAIN ITEMS SUCH AS RISES AND DROPS IN DUCTWORK,ACCESS DOORS, VOLUME DAMPERS, ETC., ARE INDICATED ON THE CONTRACT DOCUMENT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS.

2. CONTRACTOR TO CHECK AND CORRECT ANY AND ALL DEFICIENCIES IN EXISTING DUCTS. ALL NEW DUCTWORK WILL COMPLY WITH THE LATEST SMACNA GUIDELINES AND CONFORM WITH REQUIREMENTS OF THE LATEST HANDBOOKS PUBLISHED BY ASHRAE.

3. PROVIDE VOLUME DAMPER AT EACH TAP TO MAIN DUCT AND WHERE NECESSARY TO PROPERLY BALANCE SYSTEM.

4. SUPPLY AND RETURN DUCTWORK 20' FROM ALL AC UNITS SHALL BE LINED WITH 1.5" ACOUSTICAL LINING.

5. RE-INSULATE ALL DUCTWORK AND PIPING IN WHICH INSULATION HAS BEEN REMOVED OR DAMAGED WITH INSULATION EQUAL TO THE EXISTING INSULATION.

6. CONTRACTOR SHALL SUPPLY AND INSTALL ALL NECESSARY SUPPLY DIFFUSERS AND RETURN AIR REGISTERS WHERE INDICATED ON THE DRAWING. COORDINATE LOCATION OF DIFFUSERS AND REGISTERS WITH REFLECTED CEILING PLAN.

7. IN CORRIDORS WHERE CEILING SPEAKERS AND AIR DIFFUSERS ARE INDICATED BETWEEN THE SAME LIGHT FIXTURES, INSTALL BOTH DEVICES AT THE QUARTER POINTS BETWEEN THE FIXTURES.

8. UNLESS OTHERWISE SHOWN, LOCATE ALL ROOM THERMOSTATS 4'-0" (CENTER LINE) ABOVE THE FINISHED FLOOR. NOTIFY THE ENGINEER OF ANY ROOMS WHERE THE PRECEDING LOCATION CANNOT BE MAINTAINED OR WHERE THERE IS A QUESTION ON LOCATION.

9. ALL DUCTWORK SHALL CLEAR DOORS AND WINDOWS.

10. ALL DUCTWORK DIMENSIONS, AS SHOWN ON THE DRAWINGS, ARE INTERNAL CLEAR DIMENSIONS AND DUCT SIZE SHALL BE INCREASED TO COMPENSATE FOR DUCT LINING THICKNESS.

11. PROVIDE ALL 90-DEGREE SQUARE ELBOWS WITH DOUBLE RADIUS TURNING VANES UNLESS OTHERWISE INDICATED. ELBOWS IN DISHWASHER, KITCHEN, AND LAUNDRY EXHAUSTS SHALL BE OF UN-VANED SMOOTH RADIUS CONSTRUCTION WITH A RADIUS EQUAL TO 1-1/2 TIMES THE WIDTH OF THE DUCT. PROVIDE ACCESS DOORS UPSTREAM OF ALL ELBOWS WITH TURNING VANES.

12. COORDINATE DIFFUSER, REGISTER, AND GRILL LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS, LIGHTING, AND OTHER CEILING ITEMS AND MAKE MINOR DUCT MODIFICATIONS TO SUIT.

13. ALL AIR HANDLING UNITS SHALL OPERATE WITHOUT MOISTURE CARRYOVER.

14. LOCATE ALL MECHANICAL EQUIPMENT (SINGLE DUCT, CONSTANT VOLUME, UNIT HEATERS, ETC.) FOR UNOBSTRUCTED ACCESS TO UNIT ACCESS PANELS, CONTROLS, AND VALVING.

15. PROVIDE FLEXIBLE CONNECTIONS IN ALL DUCTWORK SYSTEMS (SUPPLY, RETURN, AND EXHAUST) CONNECTED TO AIR HANDLING UNITS, FANS, AND OTHER EQUIPMENT THAT REQUIRE VIBRATION ISOLATION. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AT THE POINT OF CONNECTION TO THE EQUIPMENT UNLESS OTHERWISE INDICATED.

16. UNLESS OTHERWISE NOTED, ALL DUCTWORK IS OVERHEAD, TIGHT TO THE UNDERSIDE OF THE STRUCTURE, WITH SPACE FOR INSULATION IF NEEDED.

17. RUNS OF FLEXIBLE DUCT SHALL NOT EXCEED 5 FT.

18. ALL DUCTWORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN DUCTS, INCLUDING DIVIDED DUCTS AND TRANSITIONS AROUND OBSTRUCTIONS, SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.

19. PROVIDE ACCESS DOORS IN DUCTWORK TO PROVIDE ACCESS FOR ALL SMOKE DETECTORS, FIRE DAMPERS, SMOKE DAMPERS, VOLUME DAMPERS, HUMIDIFIERS, COILS, AND OTHER ITEMS LOCATED IN THE DUCTWORK THAT REQUIRE SERVICE AND/OR INSPECTION.

20. PROVIDE ACCESS DOORS IN DUCTWORK FOR THE OPERATION, ADJUSTMENT, AND MAINTENANCE OF ALL FANS, VALVES, AND MECHANICAL EQUIPMENT.

21. ALL DUCTS SHALL BE GROUNDED ACROSS FLEXIBLE CONNECTIONS WITH FLEXIBLE COPPER GROUNDING STRAPS. GROUNDING STRAPS SHALL BE BOLTED OR SOLDERED TO BOTH THE EQUIPMENT AND THE DUCT.

22. SMOKE DETECTORS SHALL BE FURNISHED AND WIRED BY THE ELECTRICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR MOUNTING THE SMOKE DETECTOR IN DUCTWORK AS SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH THE MANUFACTURER'S PRINTED INSTRUCTIONS.

23. TERMINATE GAS VENTS FOR GAS APPLIANCES A MINIMUM OF 30 IN. ABOVE THE ROOF WITH RAIN CAP

24. SEE SPECIFICATIONS FOR DUCTWORK GAUGES, BRACING, HANGERS, AND OTHER REQUIREMENTS.

25. EXTERIOR LOUVERS ARE INDICATED FOR SIZE, GENERAL LOCATION AND PERFORMANCE ONLY. DETAILED LOUVER DESCRIPTIONS ARE PROVIDED IN THE ARCHITECTURAL SPECIFICATIONS.

26. EXCEPT AS OTHERWISE SHOWN OR NOTED, ALL DUCTWORK AND OTHER SHEET METAL WORK SHALL BE GALVANIZED SHEET STEEL AND SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC. DUCT CONSTRUCTION STANDARDS, PRESSURE CLASSIFICATION 2 IN. W.G.

27. DUCTWORK STATIC PRESSURE CLASSIFICATION:
    a. 2 IN OF W.G. UP TO 2 IN OF W.G.
    b. 6 IN OF W.G. ABOVE 2 IN & UP TO 6 IN WG

28. SEALING OF DUCTWORK SHALL COMPLY WITH SECTION 603.9 OF THE MECHANICAL CODE OF NEW YORK STATE OR IN NEW YORK CITY, THE NEW YORK CITY CONSTRUCTION CODES.

29. VOLUME DAMPERS: GALVANIZED STEEL, PER SMACNA "LOW VELOCITY MANUAL." EXCEPT PROVIDE BEARING AT ONE END OF DAMPER ROD AND QUADRANT, WITH LEVER AND LOCKSCREW AT OTHER END. FOR INSULATED DUCTS, QUADRANTS MOUNTED ON COLLAR TO CLEAR INSULATION. INSTALL WITH LEVERS ACCESSIBLE.

30. ACCESS DOORS: INSULATED OR UNINSULATED, SAME AS DUCT.

    1) PROVIDE MINIMUM 20 IN. X 20 IN. (OR EQUIVALENT) ON ALL DUCTS, UNLESS OTHERWISE APPROVED, AT FIRE DAMPERS, AND AT ALL DUCT ACCESSORIES SUCH AS HUMIDIFIERS, DUCT SMOKE DETECTORS, AUTO DAMPERS, AND LOUVERS.

    2) ACCESS DOORS SHALL BE LOCATED AT THE BOTTOM OF THE DUCT OR ON THE SIDE, AND NOT MORE THAN 16 INCHES FROM THE DUCT ACCESSORY THAT IT SERVES (FIRE DAMPER, FSD, ETC.).

    3) WHERE DUCT SIZE DOES NOT PERMIT A 20 IN. X 20 IN. (OR EQUIVALENT AREA) ACCESS DOOR, THE ACCESS DOOR SHALL BE FABRICATED OF AN AREA EQUIVALENT TO A 20 IN. X 20 IN. WITH THE SMALLER DIMENSION BEING 2 INCHES SMALLER THAN THE DUCT SIZE WHERE IT WILL BE LOCATED, AND LOCATED NOT LESS THAN 1" FROM ANY DUCT EDGE.

    4) FOR DUCTS WHICH LARGEST DIMENSION IS 12 INCHES (WIDTH AND OR HEIGHT), IT IS PERMISSIBLE TO PROVIDE A 10 IN. X 10 IN. (OR EQUIVALENT AREA) ACCESS DOOR LOCATED AT THE BOTTOM OR THE SIDE OF THE DUCT. THAN

    5) ALL ACCESS DOORS TO BE HINGED, WITH LATCH SIMILAR TO VENTLOCK NO. 100.

31. FLEXIBLE CONNECTIONS: NEOPRENE-COATED GLASS FABRIC, 30 OZ PER SQ YD WITH SEWED AND CEMENTED SEAMS, SIMILAR TO VENT FABRICS. PROVIDE WITH METAL COLLARS. ALLOW MINIMUM MOVEMENT OF 1 IN.

32. TURNING VANES: GALVANIZED STEEL SMALL DOUBLE-THICKNESS VANES WITH 2 IN. INSIDE RADIUS.

33. FIRE DAMPERS: UL LISTED, GALVANIZED STEEL CONSTRUCTION, MULTIBLADED TYPE, SPRING LOADED, EQUIPPED WITH FUSIBLE LINK, CONFORMING TO NFPA STANDARD 90A AND APPROVED BY NEW YORK CITY BOARD OF STANDARDS AND APPEALS FOR NYC CAL-100-65-5M. SIMILAR TO AIR BALANCE MODEL 319-P, RATED AS REQUIRED. SEE INSTALLATION ON DRAWING.

34. DUCTWORK FOR AREAS WITH HIGH HUMIDITY SHALL BE ALUMINUM FABRICATED ONE GAGE LARGER THAN GALVANIZED FOR THE SAME PRESSURE CLASSIFICATION. THESE DUCTS INCLUDE SHOWERS, OUTDOOR AIR INTAKE, HUMIDIFIERS, ETC.

35. ALL DUCT DIMENSIONS INDICATED ON PLANS ARE INSIDE CLEAR DIMENSIONS.

36. AUTOMATIC DAMPERS: COMPLETE WITH LINKAGE AND ELECTRIC OPERATOR. OPPOSED BLADE DAMPER OR GALVANIZED STEEL MIN. 4 IN., MAX. 8 IN. WIDE WITH COMPRESSIBLE EDGE SEALS TO PREVENT LEAKAGE. FACTORY-ASSEMBLE STEEL LINKAGE AND SHAFT WITH NYLON OR OIL-IMPREGNATED BRONZE BEARINGS. MOTOR WITH SUFFICIENT POWER TO LIMIT LEAKAGE TO 10 CFM PER SQ FT. LINKAGE TO WITHSTAND LOAD EQUAL TO TWICE MAXIMUM OPERATING FORCE WITHOUT DEFLECTION. DAMPER MOUNTED IN WELDED STEEL CHANNEL FRAME.

37. WIRE MESH SCREEN (WMS): NO. 16 USSG, 3/4 SQUARE MESH, 1 IN. WIDE GALVANIZED STEEL ENCLOSING FRAME. FLANGED DUCT OPENING TO RECEIVE FRAME.

38. COMBINATION FIRE AND SMOKE DAMPERS: UL LISTED, GALVANIZED STEEL CONSTRUCTION MULTI-BLADED TYPE. BLADES SHALL BE AIRFOIL SHAPED, DOUBLE SKIN, SINGLE PIECE CONSTRUCTION. EQUIPPED WITH FUSIBLE LINK CONFORMING TO NFPA STANDARD 90A, 92A & 92B, AND COMPLY WITH LATEST STANDARD UL555 AND UL555S WITH LEAKAGE CLASS I SMOKE DAMPERS, BLADE SEALS. SIMILAR TO RUSKIN MODEL FSD 60, NYC BSA LISTING# 176-82-SM. ACTUATOR SHALL BE ELECTRICALLY POWERED, 120 V/1 PH, AND MOUNTED IN THE FACTORY AT THE TIME OF FABRICATION.

PIPING

1. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE PIPING SYSTEMS AS INDICATED ON THE DRAWINGS AND AS SPECIFIED AND REQUIRED BY CODE.

2. UNLESS OTHERWISE NOTED, ALL PIPING IS OVERHEAD, TIGHT TO THE UNDERSIDE OF THE STRUCTURE OR SLAB, WITH SPACE FOR INSULATION IF REQUIRED.

3. INSTALL PIPING SO ALL VALVES, STRAINERS, UNIONS, TRAPS, FLANGES, AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.

4. ALL VALVES SHALL BE INSTALLED SO THAT THE VALVE REMAINS IN SERVICE WHEN EQUIPMENT OR PIPING ON THE EQUIPMENT SIDE OF THE VALVE IS REMOVED.

5. ALL VALVES (EXCEPT CONTROL VALVES) AND STRAINERS SHALL BE THE FULL SIZE OF THE PIPE BEFORE REDUCING IN SIZE TO MAKE CONNECTIONS TO EQUIPMENT AND CONTROLS.

6. UNIONS AND/OR FLANGES SHALL BE INSTALLED AT EACH PIECE OF EQUIPMENT, IN BYPASSES, AND IN LONG PIPING RUNS (100 FT. OR MORE) TO PERMIT DISASSEMBLY FOR ALTERATION AND REPAIRS.

7. INSTALL ALL PIPING WITHOUT FORCING OR SPRINGING.

8. ALL PIPING SHALL CLEAR DOORS AND WINDOWS.

9. ALL VALVES SHALL BE ADJUSTED FOR SMOOTH AND EASY OPERATION.

10. ALL PIPING SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.

11. SLOPED REFRIGERANT PIPING 1% IN THE DIRECTION OF OIL RETURN. LIQUID LINES MAY BE INSTALLED LEVEL.

12. INSTALL HORIZONTAL REFRIGERANT HOT GAS DISCHARGE PIPING WITH 1/2" PER 10 FT. DOWNWARD SLOPE AWAY FROM THE COMPRESSOR.

13. INSTALL HORIZONTAL REFRIGERANT SUCTION LINES WITH 1/2" PER 10 FT. DOWNWARD SLOPE TO THE COMPRESSOR, WITH NO LONG TRAPS OR DEAD ENDS THAT MAY CAUSE OIL TO SEPARATE FROM THE SUCTION GAS AND RETURN TO THE COMPRESSOR IN DAMAGING SLUGS.

14. PROVIDE LINE SIZE LIQUID INDICATORS IN THE MAIN LIQUID LINE LEAVING THE CONDENSER OR RECEIVER. INSTALL MOISTURE-LIQUID INDICATORS IN LIQUID LINES BETWEEN FILTER DRYERS AND THERMOSTATIC EXPANSION VALVES, AND IN LIQUID LINE TO RECEIVER.

15. PROVIDE A LINE SIZE STRAINER UPSTREAM OF EACH AUTOMATIC VALVE. PROVIDE A SHUT-OFF VALVE ON EACH SIDE OF A STRAINER.

16. PROVIDE PERMANENT FILTER DRYERS IN LOW-TEMPERATURE SYSTEMS AND SYSTEMS USING HERMETIC COMPRESSORS.

17. PROVIDE REPLACEABLE CARTRIDGE FILTER DRYERS WITH A THREE-VALVE BYPASS ASSEMBLY FOR SOLENOID VALVES, ADJACENT TO RECEIVERS.

18. PROVIDE REFRIGERANT CHARGING VALVE CONNECTIONS IN THE LIQUID LINE BETWEEN THE RECEIVER SHUTOFF VALVE AND THE EXPANSION VALVE.

PROTECTIVE COVERING FOR EXPOSED DUCT, PIPE AND INSULATION

PROTECTIVE COVERINGS SHALL BE INSTALLED ON AREAS OF INSULATION THAT ARE EXPOSED TO WEATHER OR SUBJECT TO MECHANICAL DAMAGE. THE PROTECTIVE COVERING SHALL BE:

a. ARMA-CHEK SILVER" MULTI-LAYER LAMINATE OF ALUMINUM, COATED WITH A UV PROTECTIVE FILM AND BACKED WITH A FLEXIBLE PVC FILM. THE MATERIAL SHOULD BE ADHERED WITH ARMAFLEX 520 ADHESIVE OR EQUIVALENT, AND ALL JOINS AND SEAMS SECURED WITH "ARMA-CHEK SILVER TAPE". INSTALLATION SHALL BE IN ALL CASES TO THE MANUFACTURER'S RECOMMENDATIONS.

OR

b. HIGH DENSITY RUBBER CLADDING OF THE "ARMA-CHECK R" TYPE BONDED USING AN APPROPRIATE FULL CONTACT ADHESIVE WITH A MINIMUM 50 MM OVERLAP AT ALL BUTT JOINTS AND LONGITUDINAL SEAMS. A WEATHER-PROOF MASTIC SEALANT SHALL BE APPLIED OVER ALL SEAMS AND JOINTS. ALL MATERIAL SHALL BE OVERLAPPED AND STAGGERED IN SUCH A WAY AS TO ENSURE A WATERSHED IS ALWAYS PROVIDED. INSTALLATION SHALL BE IN ALL CASES TO THE MANUFACTURER'S RECOMMENDATIONS. ALL EXCESS ADHESIVE VISIBLE ON THE SURFACE OF THE COMPLETED ASSEMBLY SHALL BE REMOVED USING AN APPROPRIATE CLEANING MATERIAL.

OR

c. METAL CLADDING, COMPRISED OF COATED SHEET METAL, WITH ALL EXTERNAL JOINTS AND FIXING MADE WEATHER-PROOF WITH SILICONE SEALANT.

SECTION 230713 – DUCT INSULATION

1.1 QUALITY ASSURANCE

SURFACE-BURNING CHARACTERISTICS: ALL INSULATION SHALL HAVE COMPOSITE (INSULATION JACKET OR FACING AND ADHESIVE USED TO ADHERE THE FACING OR JACKET TO THE INSULATION) A FLAME-SPREAD INDEX OF 25, AND SMOKE-DEVELOPED INDEX OF 50 FOR INSULATION INSTALLED INDOOR, 75, AND SMOKE-DEVELOPED INDEX OF 150 FOR INSULATION INSTALLED OUTDOORS; ACCORDING TO ASTME 84.

1.2 FIELD QUALITY CONTROL
A. FIELD INSPECTIONS: BY OWNER-ENGAGED AGENCY.

1.3 INDOOR DUCT AND PLENUM INSULATION SCHEDULE;
A. CONCEALED, RECTANGULAR, ROUND AND FLAT-OVAL, SUPPLY-RETURN, OUTDOOR-AND EXHAUST-AIR DUCT AND AIR PLENUM INSULATION:

B. FLEXIBLE ELASTOMERIC, MINERAL-FIBER BLANKET, MINERAL-FIBER BOARD OR POLYOLEFIN WITH MINIMUM INSTALLED THERMAL RESISTANCE AS FOLLOWS:

	SUPPLY	RETURN
UNCONDITIONED SPACES WITHIN BUILDING:	R-4.2	R-4.2
WITHIN BUILDING ENVELOPE ASSEMBLY:	R-6	R-4.2
OUTSIDE OF BUILDING:	R-6	R-4.2

1.4 ITEMS NOT INSULATED:
1. FIBROUS-GLASS DUCTS.
2. METAL DUCTS WITH DUCT LINER OR SUFFICIENT THICKNESS TO COMPLY WITH ENERGY CODE ANDASHRAE/IESNA 90.1.
3. FACTORY-INSULATED FLEXIBLE DUCTS.
4. FACTORY-INSULATED PLENUMS AND CASINGS.
5. FLEXIBLE CONNECTORS.
6. VIBRATION-CONTROL DEVICES.
7. FACTORY-INSULATED ACCESS PANELS AND DOORS.
8. DUCTS THAT HAVE INTERNAL ACOUSTICAL LINING.

1.5 PRODUCTS
A. THE FOLLOWING INSULATION MANUFACTURERS WILL BE ACCEPTABLE:
1. JOHNS-MANVILLE
2. OWENS-CORNING

1.6 ACOUSTICAL TREATMENT
1. WHERE SHOWN ON THE DRAWINGS, LOW PRESSURE DUCTWORK SHALL BE LINED WITH 1.5" THICK R-6 AS MANUFACTURED BY DUCTMATE, 1-1/2 POUND MINIMUM DENSITY, NEOPRENE COATED, FLEXIBLE FIBERGLASS DUCT LINER. LINING SHALL COMPLY WITH NFPA 90A AND SHALL HAVE A FLAME SPREAD CLASSIFICATION OF NOT MORE THAN 25 AND A SMOKE DEVELOPED RATING NOT MORE THAN 50. DUCT SIZES WHERE LINING IS INDICATED ON PLANS ARE MINIMUM INSIDE CLEAR DIMENSIONS REQUIRED,
4. WHERE RECTANGULAR ELBOWS ARE USED, PROVIDE TURNING VANES IN ACCORDANCE WITH SECTION 23 33 00.
5. PROVIDE EXPANDED TAKE-OFFS OR 45 DEGREE ENTRY FITTINGS FOR BRANCH DUCT CONNECTIONS WITH BRANCH DUCTWORK AIRFLOW VELOCITIES GREATER THAN 700 FPM. SQUARE EDGE 90-DEGREE TAKE-OFF FITTINGS OR STRAIGHT TAPS WILL NOT BE ACCEPTED.
6. BUTTON PUNCH SNAP-LOCK CONSTRUCTION WILL NOT BE ACCEPTED ON ALUMINUM DUCTWORK.
7. ROUND DUCTS MAY BE SUBSTITUTED FOR RECTANGULAR DUCTS IF SIZED IN ACCORDANCE WITH ASHRAE TABLE OF EQUIVALENT RECTANGULAR AND ROUND DUCTS. NO VARIATION OF DUCT CONFIGURATION OR SIZES PERMITTED EXCEPT BY WRITTEN PERMISSION OF THE ENGINEER.

C. WHERE LATEST EDITION OF SMACNA DOES NOT CLEARLY STATE GAUGES AND/OR STIFFENERS TO BE USED OR, WHERE SMACNA STANDARDS REQUIRE INTERPRETATION, THE FOLLOWING MINIMUM METAL GAUGES AND BRACING SHALL BE USED:

USG	MAX. SIDE INCHES	TRANSVERSE JOINTS AND BRACING
22	UP TO 12	S SLIP, DRIVE SLIP, ONE INCH POCKET LOCK ON 8 FOOT CENTERS
22	13 TO 24	1"X1"X1/8" ANGLES ON 4 FOOT CENTERS
20	25 TO 35	1"X1"X1/8" ANGLES ON 2 FOOT CENTERS

D. PROVIDE TAPPING IN DUCTS FOR THERMOMETERS WHERE SPECIFIED. IN ADDITION, PROVIDE AN AIRTIGHT PLUGGED TAPPING LOCATED AS FOLLOWS:
1. UPSTREAM OF EACH REHEAT COIL AND VAV BOX.
2. DOWNSTREAM OF EACH REHEAT COIL AND VAV BOX.

E. FLAT OVAL OR ROUND DUCTWORK MAY BE PROVIDED IN LIEU RECTANGULAR DUCTWORK WITH THE REINFORCEMENT FOR FLAT SIDES SAME AS SPECIFIED FOR THE RECTANGULAR DUCTWORK, AND AS PER SMACNA FLAT OVAL DUCT CONSTRUCTION STANDARDS SHOWN IN FIG. 3-6 AND AS SHOWN IN FIG. 3-1 AND 3-2 FOR ROUND DUCTWORK.

F. ALL DUCTWORK SHALL BE SEALED TO CLASS "A" AND LEAK TESTED TO MEAT SMACNA CLASS 6 FOR RECTANGULAR AND CLASS 3 FOR ROUND DUCTS.

1.2 MATERIALS
A. SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS.
B. SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS.
C. SHEET METAL MATERIALS:
1. GALVANIZED SHEET STEEL.
2. STAINLESS-STEEL SHEETS.
3. ALUMINUM SHEETS.
4. FACTORY-APPLIED ANTI-MICROBIAL COATING.

D. DUCT LINER:
1. FIBROUS GLASS, TYPE I, FLEXIBLE.
   a. WITH ANTI-MICROBIAL EROSION-RESISTANT COATING.
2. FLEXIBLE ELASTOMERIC.
3. NATURAL FIBER.

E. SEALANT MATERIALS:
1. TWO-PART TAPE SEALING SYSTEM.
2. WATER-BASED JOINT AND SEAM SEALANT.
3. SOLVENT-BASED JOINT AND SEAM SEALANT.
4. FLANGED JOINT SEALANT.
5. FLANGE GASKETS.
6. ROUND DUCT JOINT O-RING SEALS.

1.3 DUCT CLEANING
A. CLEAN EXISTING DUCT SYSTEM(S) BEFORE TESTING, ADJUSTING, AND BALANCING.
B. CLEAN THE FOLLOWING ITEMS:
1. AIR OUTLETS AND INLETS.
2. SUPPLY, RETURN, AND EXHAUST FANS.
3. AIR-HANDLING UNITS.
4. COILS AND RELATED COMPONENTS.
5. RETURN-AIR DUCTS, DAMPERS, ACTUATORS, AND TURNING VANES.
6. SUPPLY-AIR DUCTS, DAMPERS, ACTUATORS, AND TURNING VANES.
7. DEDICATED EXHAUST AND VENTILATION COMPONENTS AND MAKEUP AIR SYSTEMS.

1.4 DUCT SCHEDULE
A. ALL DUCTS SHALL BE GALVANIZED STEEL EXCEPT AS FOLLOWS:
8. MOIST ENVIRONMENT DUCT MATERIAL: ALUMINUM.

END OF SECTION 233113

SECTION 233113 – METAL DUCTS

1.1 CONSTRUCTION
A. EACH DUCT SYSTEM SHALL BE CONSTRUCTED FOR THE SPECIFIC SMACNA DUCT PRESSURE CLASSIFICATIONS SHOWN ON THE CONTRACT DRAWINGS. WHERE NO PRESSURE CLASSES ARE SPECIFIED BY THE DESIGNER, THE SMACNA 1 INCH WG PRESSURE, SEAL CLASS "A".

B. ALL DUCTWORK SHALL BE CONSTRUCTED TO SMACNA 1" WG DESIGN AND NOT LESS THAN THE FOLLOWING STANDARDS:
1. CONSTRUCT SO THAT ALL INTERIOR SURFACES ARE SMOOTH. USE SLIP AND DRIVE OR FLANGED AND BOLTED CONSTRUCTION WHEN FABRICATING RECTANGULAR DUCTWORK. USE SPIRAL LOCK SEAM CONSTRUCTION WHEN FABRICATING ROUND SPIRAL DUCTWORK. SHEET METAL SCREWS MAY BE USED ON DUCT HANGERS, TRANSVERSE JOINTS AND OTHER SMACNA APPROVED LOCATIONS IF THE SCREW DOES NOT EXTEND MORE THAN 1/2 INCH INTO THE DUCT.
2. SHEET STEEL SHALL COMPLY WITH ASTMA653 STANDARD SPECIFICATION FOR STEEL SHEET METAL, ZINC COATED (GALVANIZED) OR ZINC IRON ALLOY-COATED (GALVANINEALED) BY HOT DIP PROCESS, AND A924 STANDARD SPECIFICATION FOR GENERAL REQUIREMENT FOR SHEET METALLIC-COATED BY HOT DIP PROCESS. ALL ANGLE IRON USED FOR SUPPORT SHALL BE GALVANIZED. CONNECTIONS TO WALLS OR FLOOR SHALL BE AIR TIGHT WITH ANGLE IRON AND CAULKING. SEAL ALL DUCT SEAMS, TRANSVERSE AND LONGITUDINAL, AIR TIGHT. PROVIDE TURNING VANES ALL 90° ELBOWS.
3. USE ELBOWS AND TEES WITH A CENTER LINE RADIUS TO WIDTH OR DIAMETER RATIO OF 1.5 WHEREVER SPACE PERMITS. WHEN A SHORTER RADIUS MUST BE USED DUE TO LIMITED SPACE, INSTALL SINGLE WALL SHEET METAL SPLITTER VANES IN ACCORDANCE WITH SMACNA PUBLICATIONS, TYPE RE 3. WHERE SPACE WILL NOT ALLOW AND THE C VALUE OF THE RADIUS ELBOW, AS GIVEN IN SMACNA PUBLICATIONS, EXCEEDS 0.31, USE RECTANGULAR ELBOWS WITH TURNING VANES AS SPECIFIED IN SECTION 23 33 00. SQUARE THROAT-RADIUS HEEL ELBOWS WILL NOT BE ACCEPTABLE. STRAIGHT TAPS OR BULLHEAD TEES ARE NOT ACCEPTABLE.

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MECHANICAL SPECIFICATIONS (1 OF 2)

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NON–METAL DUCTS

A. ALL DUCTS SHALL BE FABRICATED AND INSTALLED IN ACCORDANCE WITH SMACNA/ANSI–HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE, LATEST EDITION, SMACNA HVAC AIR DUCT LEAKAGE TEST MANUAL LATEST EDITION, NAIMA FIBROUS GLASS DUCT CONSTRUCTION STANDARD AND 2020 FBC– MECHANICAL CODE , SECTION 603. THE MORE STRINGENT REQUIREMENT OF ANY CODES SHALL APPLY.

B. NONMETALLIC DUCTS SHALL BE CONSTRUCTED WITH CLASS 0 OR CLASS 1 DUCT MATERIAL AND SHALL COMPLY WITH UL 181. FIBROUS DUCT BOARD CONSTRUCTION SHALL CONFORM TO THE SMACNA FIBROUS GLASS DUCT CONSTRUCTION STANDARDS OR NAIMA FIBROUS GLASS DUCT CONSTRUCTION STANDARDS. THE AIR TEMPERATURE WITHIN NONMETALLIC DUCTS SHALL NOT EXCEED 250°F (121°C).

C. THE USE OF GYPSUM BOARDS TO FORM AIR SHAFTS (DUCTS) SHALL BE LIMITED TO RETURN AIR SYSTEMS WHERE THE AIR TEMPERATURES DO NOT EXCEED 125°F (52°C) AND THE GYPSUM BOARD SURFACE TEMPERATURE IS MAINTAINED ABOVE THE AIRSTREAM DEW–POINT TEMPERATURE. AIR DUCTS FORMED BY GYPSUM BOARDS SHALL NOT BE INCORPORATED IN AIR–HANDLING SYSTEMS UTILIZING EVAPORATIVE COOLERS.

D. FACTORY–MADE FLEXIBLE AIR DUCTS SHALL NOT BE LIMITED IN LENGTH AND CONNECTORS SHALL NOT BE MORE THAN 5 FEET IN LENGTH AND SHALL NOT BE USED IN LIEU OF RIGID ELBOW OR FITTINGS. FLEXIBLE AIR DUCTS SHALL BE PERMITTED TO BE USED AS AN ELBOW AT A TERMINAL DEVICE.

SECTION 233713 – DIFFUSERS, REGISTERS, AND GRILLES

1.1 PRODUCTS

A. DIFFUSERS, REGISTERS AND GRILLES SHALL BE FURNISHED AND INSTALLED FOR CAPACITIES AND IN LOCATIONS INDICATED ON DRAWINGS. ALL REGISTERS AND DIFFUSERS SHALL BE PRIME COATED STEEL OR EXTRUDED ALUMINUM FINISHED UNLESS OTHERWISE NOTED IN BAKED WHITE ENAMEL.

B. MANUFACTURERS: TITUS

1. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCT BY ONE OF THE FOLLOWING:
   a. CARNES.
   b. HART & COOLEY INC.
   c. KRUEGER.
   d. METALAIRE, INC.
   e. NAILOR INDUSTRIES INC.
   f. RUSKIN

C. ALL DIFFUSERS SHALL HAVE CONTROLLING/EQUALIZING GRID AND OPPOSED BLADE DAMPER UNLESS OTHERWISE NOTED.

D. ALL DUCTED RETURN REGISTERS SHALL HAVE AN OPPOSED BLADE DAMPER UNLESS OTHERWISE NOTED.

2. END OF SECTION 233713

PIPING INSULATION

A. INSULATE ALL PIPING IN ACCORDANCE WITH INSULATION SCHEDULE EXCEPT AS OTHERWISE NOTED.

INSULATION SCHEDULE – PIPING

SERVICE	SIZE	THICKNESS	MATERIAL FINISH
REFRIGERANT PIPING	<1.5"	1.5"	P–6
CONDENSATE DRAIN PIPING	<1.5"	0.5"	P–6

B. PIPING, VALVES AND FITTINGS TO BE INSULATED:

1) LOW TEMPERATURE PIPING SYSTEMS – 0 TO 55 DEG F INCLUDING:
   a. CONDENSATE DRAIN PIPING.

2) PROTECTIVE COVERINGS SHALL BE INSTALLED ON AREAS OF INSULATION THAT ARE EXPOSED TO WEATHER OR SUBJECT TO MECHANICAL DAMAGE. THE PROTECTIVE COVERING SHALL BE:
   a. ARMA–CHEK SILVER" MULTI–LAYER LAMINATE OF ALUMINUM, COATED WITH A UV PROTECTIVE FILM AND BACKED WITH A FLEXIBLE PVC FILM. THE MATERIAL SHOULD BE ADHERED WITH ARMAFLEX 520 ADHESIVE OR EQUIVALENT, AND ALL JOINS AND SEAMS SECURED WITH "ARMA–CHEK SILVER TAPE". INSTALLATION SHALL BE IN ALL CASES TO THE MANUFACTURER'S RECOMMENDATIONS.
   OR
   b. HIGH DENSITY RUBBER CLADDING OF THE "ARMA–CHECK R" TYPE BONDED USING AN APPROPRIATE FULL CONTACT ADHESIVE WITH A MINIMUM 50 MM OVERLAP AT ALL BUTT JOINTS AND LONGITUDINAL SEAMS. A WEATHER–PROOF MASTIC SEALANT SHALL BE APPLIED OVER ALL SEAMS AND JOINTS. ALL MATERIAL SHALL BE OVERLAPPED AND STAGGERED IN SUCH A WAY AS TO ENSURE A WATERSHED IS ALWAYS PROVIDED. INSTALLATION SHALL BE IN ALL CASES TO THE MANUFACTURER'S RECOMMENDATIONS. ALL EXCESS ADHESIVE VISIBLE ON THE SURFACE OF THE COMPLETED ASSEMBLY SHALL BE REMOVED USING AN APPROPRIATE CLEANING MATERIAL.
   OR
   c. METAL CLADDING, COMPRISED OF COATED SHEET METAL, WITH ALL EXTERNAL JOINTS AND FIXING MADE WEATHER–PROOF WITH SILICONE SEALANT.

C. MATERIAL:

1) TYPE P–1: MINIMUM 4 LB DENSITY MOLDED FIBERGLASS, MAXIMUM 0.24 K–FACTOR AT 75 DEG F MEAN TEMPERATURE WITH FACTORY–APPLIED FIRE–RETARDANT FOIL–SKRIM–KRAFT FACING. ALL SERVICE JACKET. SIMILAR TO OWENS–CORNING 650 ASJ.

2) TYPE P–3: MINIMUM 4 LB DENSITY MOLDED FIBERGLASS FITTING, MAXIMUM 0.23 K–FACTOR AT 75 DEG F MEAN TEMPERATURE SIMILAR TO EPOLUX HAMFAB MOLDED FITTINGS.
3) TYPE P–4: MINIMUM 1 LB DENSITY FIBERGLASS FITTING INSERTS, MAXIMUM 0.27 K–FACTOR AT 75 DEG F MEAN TEMPERATURE SIMILAR TO MANVILLE HI–LO TEMP INSULATION INSERTS.

4) TYPE P–6: MINIMUM 6 LB MOLDED FOAMED PLASTIC. MAXIMUM 0.27 K–FACTOR AT 75 DEG F MEAN TEMPERATURE. MAXIMUM 0.17 PERMEANCE. SIMILAR TO ARMSTRONG ARMAFLEX II.

D. FINISH:

1) TYPE F–1: FITTING COVER, MOLDED WHITE PVC JACKET, UL CLASS 1, MAXIMUM PERMEANCE 0.05 SIMILAR TO MANVILLE ZESTRON.

2) TYPE F–2: WHITE VAPOR BARRIER COATING WITH 10X10 OR 20X20 MESH WHITE GLASS, POLYESTER OR NYLON CLOTH REINFORCING MEMBRANE, MINIMUM 31 MIL DRY FILM THICKNESS, SIMILAR TO FOSTER TITE–FIT, UL LABEL.

3) TYPE F–4: ALUMINUM JACKETING WITH MINIMUM 0.016 IN. WALL THICKNESS AND LONGITUDINAL JOINTS WITH LOCK SEAMS.

4) TYPE F–6: WHITE FINISHING AND INSULATING CEMENT APPLIED OVER HEXAGONAL WIRE MESH. CEMENT SIMILAR TO KEENE SUPERSLICK.

E. INSTALLATION:

3) BEFORE APPLYING INSULATION ALL PRESSURE AND LEAK TESTS SHALL BE COMPLETED AND APPROVED.

SECTION 230518 – ESCUTCHEONS FOR HVAC PIPING

PART 2 – PRODUCTS

2.1 ESCUTCHEONS
A. ONE–PIECE, CAST–BRASS TYPE: WITH POLISHED, CHROME–PLATED AND ROUGH–BRASS FINISH AND SETSCREW FASTENER.
B. ONE–PIECE, DEEP–PATTERN TYPE: DEEP–DRAWN, BOX–SHAPED BRASS WITH CHROME–PLATED FINISH AND SPRING–CLIP FASTENERS.
C. ONE–PIECE, STAMPED–STEEL TYPE: WITH CHROME–PLATED FINISH AND SPRING–CLIP FASTENERS.

2.2 FLOOR PLATES
A. ONE–PIECE FLOOR PLATES: CAST–IRON FLANGE WITH HOLES FOR FASTENERS.

SECTION 230517 – SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

1.1 SLEEVE–SEAL SYSTEMS
A. FIELD–ASSEMBLED, MODULAR SEALING–ELEMENT UNIT FOR FILLING ANNULAR SPACE BETWEEN PIPING AND SLEEVE.
1. SEALING ELEMENTS: EPDM RUBBER OR NBR.
2. PRESSURE PLATES: CARBON STEEL, PLASTIC, STAINLESS STEEL.
3. CONNECTING BOLTS AND NUTS: CARBON STEEL WITH CORROSION–RESISTANT COATING, STAINLESS STEEL.
B. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
1. ADVANCE PRODUCTS & SYSTEMS, INC.
2. CALPICO, INC.
3. METRAFLEX COMPANY (THE).
4. PIPELINE SEAL AND INSULATOR, INC.
5. PROCO PRODUCTS, INC.

1.2 SLEEVE–SEAL FITTINGS
A. MANUFACTURED PLASTIC, SLEEVE–TYPE, PLASTIC OR RUBBER WATER–STOP ASSEMBLY MADE FOR IMBEDDING IN CONCRETE SLAB OR WALL.

1.3 GROUT
A. NON–SHRINK, FACTORY PACKAGED.

1.4 SLEEVE AND SLEEVE–SEAL SCHEDULE
A. USE SLEEVES AND SLEEVE SEALS FOR THE FOLLOWING PIPING–PENETRATION APPLICATIONS:
1. INTERIOR PARTITIONS:
   a. PIPING SMALLER THAN NPS 6 (DN 150): GALVANIZED–STEEL–PIPE SLEEVES, PVC–PIPE SLEEVES.
   b. PIPING NPS 6 (DN 150) AND LARGER: GALVANIZED–STEEL–SHEET SLEEVES.

END OF SECTION 230517

SECTION 230593 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

1.1 SUMMARY
A. TESTING, ADJUSTING, AND BALANCING FOR THE FOLLOWING:
1. AIR SYSTEMS: CONSTANT
2. CONDENSING UNITS
3. GAS FIRED EQUIPMENT (FURNACE)

1.2 QUALITY ASSURANCE
A. THE CONTRACTOR SHALL PROCURE THE SERVICES OF A TESTING, ADJUSTING AND BALANCING (TAB) SPECIALIST WHO SPECIALIZES IN HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS. THE TAB AGENT SHALL HAVE THE FOLLOWING QUALIFICATIONS: AABC, NEBB OR TABB CERTIFIED.

1.3 EXECUTION
A. THE TAB SPECIALIST SHALL PERFORM FLOW MEASUREMENTS OF ALL EXISTING AIR AND HYDRONIC SYSTEMS THAT ARE TO REMAIN OR TO BE INCORPORATED INTO NEW WORK PRIOR TO THE STARTING OF WORK IN THE PROJECT SCOPE. A REPORT OF THESE MEASUREMENTS, INDICATING ANY AND ALL DEFICIENCIES SHALL BE SUBMITTED FOR OWNER REVIEW.
B. THE TAB SPECIALIST SHALL PERFORM FLOW MEASUREMENTS OF ALL NEW AIR AND HYDRONIC SYSTEMS AS LISTED ABOVE IN THE PROJECT SCOPE. A REPORT OF THESE MEASUREMENTS, INDICATING ANY AND ALL DEFICIENCIES SHALL BE SUBMITTED FOR OWNER REVIEW.
C. THE REPORT SHALL INDICATE A SCHEMATIC DIAGRAM INDICATING LOCATIONS OF ALL EQUIPMENT TESTED AND MEASUREMENT LOCATIONS.
D. PRIOR TO FINAL INSPECTION OF THE WORK, THE TAB SPECIALIST SHALL BALANCE ALL SYSTEMS AS INDICATED ABOVE TO THE REQUIREMENTS OF THE DESIGN.
E. THE CONTRACTOR SHALL HAVE FURNISH AND INSTALL ALL ADDITIONAL BALANCING EQUIPMENT, PRESSURE TAPS, GAUGES AND OTHER EQUIPMENT AS REQUIRED FOR A PROPERLY BALANCED SYSTEM AT NO ADDITIONAL COST TO THE OWNER. SUCH ADDITIONAL EQUIPMENT SHALL ADHERE IN STRICT ACCORDANCE WITH THE RESPECTIVE EQUIPMENT MANUFACTURER'S RECOMMENDATIONS.
F. THE CONTRACTOR SHALL HAVE THE TESTING AND BALANCING SPECIALIST COORDINATE ALL WORK OF THIS SECTION WITH THE BUILDING MANAGER. BALANCING WORK SHALL NOT CONFLICT WITH OTHER WORK SO AS TO MAINTAIN COMPLETION WITHIN THE SPECIFIED TIME.
G. ALL INSTRUMENTS USED FOR TAB SHALL BE MAINTAINED IN GOOD WORKING CONDITION AND ACCURATELY CALIBRATED.
H. TOLERANCES: PLUS OR MINUS 5 PERCENT OF DESIGN VALUES.
I. INSPECTIONS: RANDOM CHECKS BY OWNER OR ARCHITECT TO VERIFY FINAL TESTING, ADJUSTING, AND BALANCING REPORT.
J. ADDITIONAL TESTS: RANDOM TESTS WITHIN 90 DAYS OF COMPLETING TAB TO VERIFY BALANCE CONDITIONS AND SEASONAL TESTS.

END OF SECTION 230593

THERMOSTATIC CONTROLS:

C403.2.4.1 THERMOSTATIC CONTROLS
THE SUPPLY OF HEATING AND COOLING ENERGY TO EACH ZONE SHALL BE CONTROLLED BY INDIVIDUAL THERMOSTATIC CONTROLS CAPABLE OF RESPONDING TO TEMPERATURE WITHIN THE ZONE. WHERE HUMIDIFICATION OR DEHUMIDIFICATION OR BOTH IS PROVIDED, NOT FEWER THAN ONE HUMIDITY CONTROL DEVICE SHALL BE PROVIDED FOR EACH HUMIDITY CONTROL SYSTEM.

C403.2.4.1.2 DEADBAND
WHERE USED TO CONTROL BOTH HEATING AND COOLING, ZONE THERMOSTATIC CONTROLS SHALL BE CONFIGURED TO PROVIDE A TEMPERATURE RANGE OR DEADBAND OF NOT LESS THAN 5°F (2.8°C) WITHIN WHICH THE SUPPLY OF HEATING AND COOLING ENERGY TO THE ZONE IS SHUT OFF OR REDUCED TO A MINIMUM.

C403.2.4.1.3 SETPOINT OVERLAP RESTRICTION
WHERE A ZONE HAS A SEPARATE HEATING AND A SEPARATE COOLING THERMOSTATIC CONTROL LOCATED WITHIN THE ZONE, A LIMIT SWITCH, MECHANICAL STOP OR DIRECT DIGITAL CONTROL SYSTEM WITH SOFTWARE PROGRAMMING SHALL BE CONFIGURED TO PREVENT THE HEATING SETPOINT FROM EXCEEDING THE COOLING SETPOINT AND TO MAINTAIN A DEADBAND IN ACCORDANCE WITH SECTION C403.4.1.2.

C403.2.4.2 OFF–HOUR CONTROLS
EACH ZONE SHALL BE PROVIDED WITH THERMOSTATIC SETBACK CONTROLS THAT ARE CONTROLLED BY EITHER AN AUTOMATIC TIME CLOCK OR PROGRAMMABLE CONTROL SYSTEM.

C403.2.4.2.1 THERMOSTATIC SETBACK
THERMOSTATIC SETBACK CONTROLS SHALL BE CONFIGURED TO SET BACK OR TEMPORARILY OPERATE THE SYSTEM TO MAINTAIN ZONE TEMPERATURES DOWN TO 55°F (13°C) OR UP TO 85°F (29°C).

C403.2.4.2.2 AUTOMATIC SETBACK AND SHUTDOWN
AUTOMATIC TIME CLOCK OR PROGRAMMABLE CONTROLS SHALL BE CAPABLE OF STARTING AND STOPPING THE SYSTEM FOR SEVEN DIFFERENT DAILY SCHEDULES PER WEEK AND RETAINING THEIR PROGRAMMING AND TIME SETTING DURING A LOSS OF POWER FOR NOT FEWER THAN 10 HOURS. ADDITIONALLY, THE CONTROLS SHALL HAVE A MANUAL OVERRIDE THAT ALLOWS TEMPORARY OPERATION OF THE SYSTEM FOR UP TO 2 HOURS; A MANUALLY OPERATED TIMER CONFIGURED TO OPERATE THE SYSTEM FOR UP TO 2 HOURS; OR AN OCCUPANCY SENSOR.

C403.2.4.2.3 AUTOMATIC AND OPTIMUM START CAPABILITIES (MANDATORY)
AUTOMATIC START CONTROLS SHALL BE PROVIDED FOR EACH HVAC SYSTEM. THE CONTROLS SHALL BE CONFIGURED TO AUTOMATICALLY ADJUST THE DAILY START TIME OF THE HVAC SYSTEM IN ORDER TO BRING EACH SPACE TO THE DESIRED OCCUPIED TEMPERATURE IMMEDIATELY PRIOR TO SCHEDULED OCCUPANCY.
INDIVIDUAL HEATING AND COOLING SYSTEMS WITH SETBACK CONTROLS AND DIRECT DIGITAL CONTROL SHALL HAVE OPTIMUM START CONTROLS. THE CONTROL ALGORITHM SHALL, AS A MINIMUM, BE A FUNCTION OF THE DIFFERENCE BETWEEN SPACE TEMPERATURE AND OCCUPIED SET POINT, THE OUTDOOR TEMPERATURE, AND THE AMOUNT OF TIME PRIOR TO SCHEDULED OCCUPANCY. MASS RADIANT FLOOR SLAB SYSTEMS SHALL INCORPORATE FLOOR TEMPERATURE INTO THE OPTIMUM START ALGORITHM.

REFRIGERANT PIPING SYSTEM TEST

1108.1 GENERAL
EVERY REFRIGERANT–CONTAINING PART OF EVERY SYSTEM THAT IS ERECTED ON THE PREMISES, EXCEPT COMPRESSORS, CONDENSERS, VESSELS, EVAPORATORS, SAFETY DEVICES, PRESSURE GAUGES AND CONTROL MECHANISMS THAT ARE LISTED AND FACTORY TESTED, SHALL BE TESTED AND PROVED TIGHT AFTER COMPLETE INSTALLATION, AND BEFORE OPERATION. TESTS SHALL INCLUDE BOTH THE HIGH– AND LOW–PRESSURE SIDES OF EACH SYSTEM AT NOT LESS THAN THE LOWER OF THE DESIGN PRESSURES OR THE SETTING OF THE PRESSURE RELIEF DEVICE(S). THE DESIGN PRESSURES FOR TESTING SHALL BE THOSE LISTED ON THE CONDENSING UNIT, COMPRESSOR OR COMPRESSOR UNIT NAMEPLATE, AS REQUIRED BY ASHRAE 15.
EXCEPTIONS:
1. GAS BULK STORAGE TANKS THAT ARE NOT PERMANENTLY CONNECTED TO A REFRIGERATION SYSTEM.
2. SYSTEMS ERECTED ON THE PREMISES WITH COPPER TUBING NOT EXCEEDING 5/8–INCH (15.8 MM) OD, WITH WALL THICKNESS AS REQUIRED BY ASHRAE 15, SHALL BE TESTED IN ACCORDANCE WITH SECTION 1108.1, OR BY MEANS OF REFRIGERANT CHARGED INTO THE SYSTEM AT THE SATURATED VAPOR PRESSURE OF THE REFRIGERANT AT 70°F (21°C) OR HIGHER.
3. LIMITED–CHARGE SYSTEMS EQUIPPED WITH A PRESSURE RELIEF DEVICE, ERECTED ON THE PREMISES, SHALL BE TESTED AT A PRESSURE NOT LESS THAN ONE AND ONE–HALF TIMES THE PRESSURE SETTING OF THE RELIEF DEVICE. IF THE EQUIPMENT OR APPLIANCE HAS BEEN TESTED BY THE MANUFACTURER AT ONE AND ONE–HALF TIMES THE DESIGN PRESSURE, THE TEST AFTER ERECTION ON THE PREMISES SHALL BE CONDUCTED AT THE DESIGN PRESSURE.

1108.1.1 BOOSTER COMPRESSOR
WHERE A COMPRESSOR IS USED AS A BOOSTER TO OBTAIN AN INTERMEDIATE PRESSURE AND DISCHARGES INTO THE SUCTION SIDE OF ANOTHER COMPRESSOR, THE BOOSTER COMPRESSOR SHALL BE CONSIDERED A PART OF THE LOW SIDE, PROVIDED THAT IT IS PROTECTED BY A PRESSURE RELIEF DEVICE.

1108.1.2 CENTRIFUGAL/NONPOSITIVE DISPLACEMENT COMPRESSORS
IN FIELD–TESTING SYSTEMS USING CENTRIFUGAL OR OTHER NONPOSITIVE DISPLACEMENT COMPRESSORS, THE ENTIRE SYSTEM SHALL BE CONSIDERED AS THE LOW–SIDE PRESSURE FOR FIELD TEST PURPOSES.

1108.2 TEST GASES
TESTS SHALL BE PERFORMED WITH AN INERT DRIED GAS INCLUDING, BUT NOT LIMITED TO, NITROGEN AND CARBON DIOXIDE. OXYGEN, AIR, COMBUSTIBLE GASES AND MIXTURES CONTAINING SUCH GASES SHALL NOT BE USED.
EXCEPTION: THE USE OF AIR IS ALLOWED TO TEST R–717, AMMONIA, SYSTEMS PROVIDED THAT THEY ARE SUBSEQUENTLY EVACUATED BEFORE CHARGING WITH REFRIGERANT.

1108.3 TEST APPARATUS
THE MEANS USED TO BUILD UP THE TEST PRESSURE SHALL HAVE EITHER A PRESSURE–LIMITING DEVICE OR A PRESSURE–REDUCING DEVICE AND A GAUGE ON THE OUTLET SIDE.

1108.4 DECLARATION
A CERTIFICATE OF TEST SHALL BE PROVIDED FOR ALL SYSTEMS CONTAINING 55 POUNDS (25 KG) OR MORE OF REFRIGERANT. THE CERTIFICATE SHALL GIVE THE NAME OF THE REFRIGERANT AND THE FIELD TEST PRESSURE APPLIED TO THE HIGH SIDE AND THE LOW SIDE OF THE SYSTEM. THE CERTIFICATION OF TEST SHALL BE SIGNED BY THE INSTALLER AND SHALL BE MADE PART OF THE PUBLIC RECORD.

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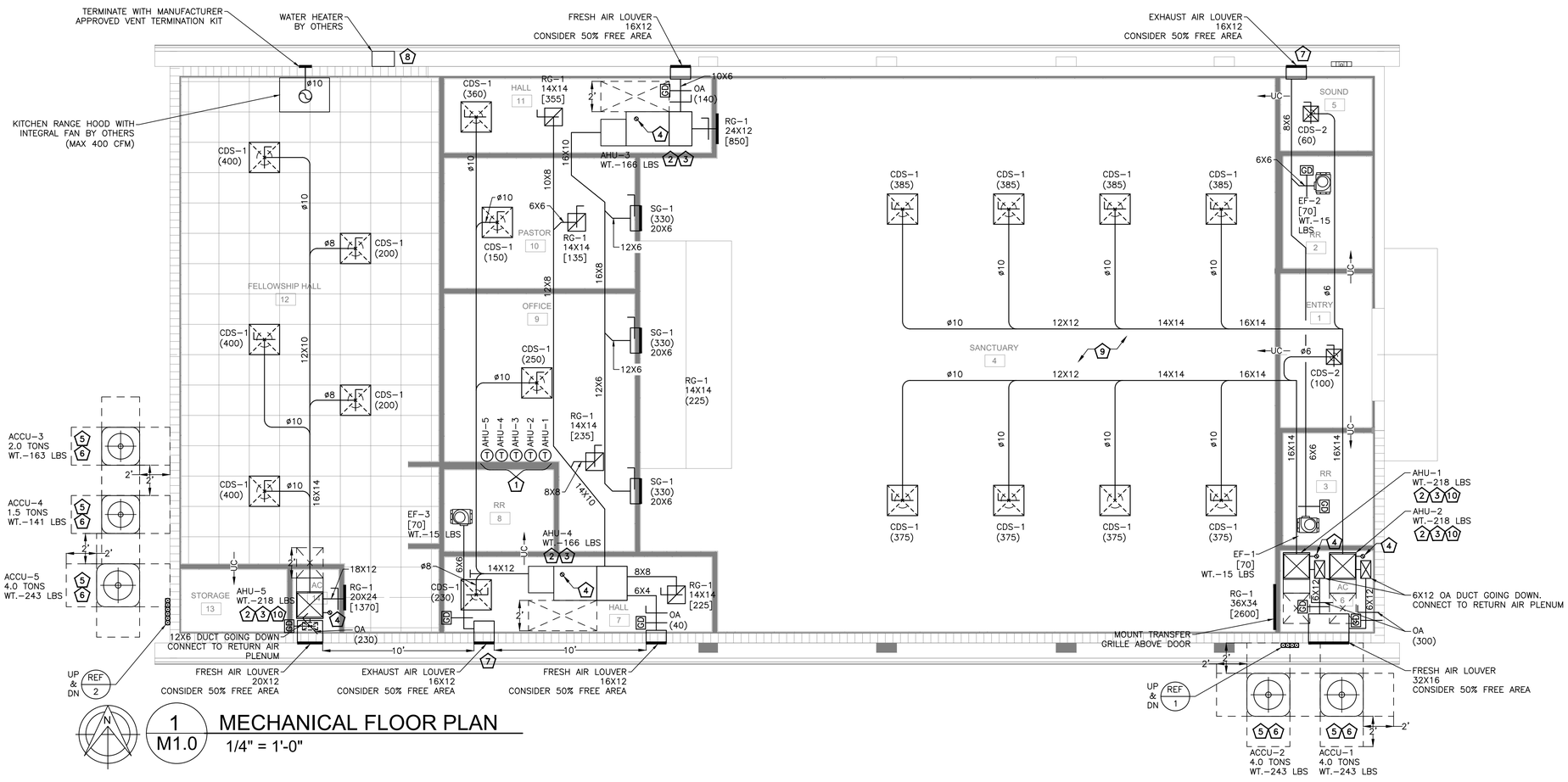

1 MECHANICAL FLOOR PLAN
M1.0 1/4" = 1'-0"

MECHANICAL GENERAL NOTES:

A. CONTRACTOR SHALL BALANCE EACH DEVICE WITH THE CFM SHOWN ON PLAN.

B. NEW DUCTWORK SHOWN ON PLAN ARE SCHEMATIC ONLY. CONTRACTOR SHALL COORDINATE WITH OTHER TRADES FOR PIPING AND DUCTWORK ROUTING. OFFEST AND RUN PIPING, DUCTWORK INSIDE THE STRUCTURE IF REQUIRED. PROVIDE ANY EXTRA PIPING, DUCTWORK, FITTINGS, INSULATIONS AND OTHER ACCESSORIES IN ORDER TO COMPLETE THE INSTALLATION.

C. EQUIPMENT SIZES, DIMENSIONS AND REQUIRED CONNECTIONS SHALL BE VERIFIED WITH THE ACTUAL EQUIPMENT SELECTED VENDOR DRAWINGS BEFORE FABRICATION OF DUCTWORK, PIPING ETC.

D. DUCT SIZES SHOWN ON PLANS ARE CLEAR INSIDE AIR STREAM DIMENSIONS.

E. CONTRACTOR SHALL COORDINATE ALL ELECTRICAL REQUIREMENTS FOR ALL HVAC BASED ON ACTUAL EQUIPMENT SELECTED PRIOR TO INSTALLATION.

F. CONTRACTOR SHALL COORDINATE EQUIPMENT WEIGHTS AND SUPPORTS BASED ON ACTUAL EQUIPMENT SELECTED.

G. COORDINATE WITH ALL TRADES FOR MATERIALS IN RATED AND PLENUM SPACES.

H. ALL SOURCE OF MECHANICAL INTAKE SHALL MAINTAIN 10 LINEAR FEET SEPARATION BETWEEN ANY SOURCE OF EXHAUST. CONTRACTOR IS RESPONSIBLE TO ADJUST DUCT LENGTH AS NEEDED.

I. MOUNT DUCTWORK AS HIGH AS POSSIBLE.

J. TEST AND BALANCE AIR SYSTEMS. PROVIDE REPORT TO G.C AND OWNER.

K. ALL EXPOSED ROUND DUCTWORK SHALL BE INTERNALLY LINED. ALL DUCTWORK DIMENSIONS ARE CLEAR INSIDE DIMENSIONS.

L. PROVIDE FIRE OR SMOKE OR FIRE+SMOKE DAMPER WHEREVER DUCTS ARE CROSSING FIRE/SMOKE RATED WALLS/BARRIERS. COORDINATE WITH ARCHITECTURAL DRAWINGS FOR FIRE RATINGS OF THE WALLS.

M. ALL EQUIPMENT SHALL MAINTAIN MINIMUM CLEARANCE FROM THE COMBUSTIBLE MATERIAL AS PER MANUFACTURE RECOMMENDATION.

N. PROVIDE MINIMUM R-6 INSULATION (EXTERNAL) FOR OUTSIDE AIR INTAKE DUCTS. PROVIDE MINIMUM R-4.2 INSULATION (INTERNAL FOR EXPOSED DUCTS AND EXTERNAL FOR CONCEALED DUCTS) FOR SUPPLY & RETURN AIR DUCTS IN CONDITIONED SPACES PROVIDE ACOUSTIC INSULATION ON MAIN SUPPLY AND RETURN DUCTS UP TO 10 FT. FROM HVAC UNIT.

O. PROVIDE CORD OPERATED DAMPERS IN INACCESSIBLE CEILINGS.

P. PROVIDE 1/2" UNDERCUT TO RESTROOM DOORS FOR MAKEUP AIR.

Q. PROVIDE WEATHERPROOF COATING OVER ALL EXPOSED REFRIGERANT PIPE INSULATION.

MECHANICAL FLOOR PLAN KEY NOTES:

1. PROVIDE NEW 24X7 PROGRAMMABLE THERMOSTAT WITH LOCKABLE COVER AS SHOWN ON PLAN. COORDINATE EXACT LOCATION WITH ARCHITECT/OWNER PRIOR TO ROUGH-IN.
2. PROVIDE TEMPERATURE SENSOR IN RETURN AIR PLENUM. WIRE BACK TO RESPECTIVE T-STAT.
3. PROVIDE 3/4" CONDENSATE DRAIN PIPE SLOPED AT 1/8" PER FT. AND TERMINATE TO OUTSIDE GREEN AREA WITH SPLASH BLOCK OR AT APPROVED LOCATION OF CONDENSATE DISPOSAL PER LOCAL CODES OR AHJ. COORDINATE ON SITE WITH PLUMBING CONTRACTOR.
4. TERMINATE ø3" FLUE VENT FOR FURNACE ON THE ROOF WITH MANUFACTURER APPROVED VENT TERMINATION KIT.
5. INSTALL REFRIGERANT PIPING BETWEEN INDOOR AND OUTDOOR UNITS AS PER MANUFACTURERS RECOMMENDATIONS. PROVIDE INSULATION TO REFRIGERANT PIPING AS PER 2023 FLORIDA ENERGY CONSERVATION CODE. COORDINATE REFRIGERANT PIPE ROUTING TO OUTDOOR UNIT WITH ARCHITECT/OWNER.
6. PROVIDE 4" CONCRETE PAD FOR CONDENSER UNIT MOUNTING.
7. EXHAUST OUTLET SHALL TERMINATE 3 FEET FROM PROPERTY LINES, 3 FEET FROM OPERABLE OPENING INTO THE BUILDING AND 10 FEET FROM MECHANICAL AIR INTAKES.
8. PROVIDE MANUFACTURER RECOMMENDED OUTDOOR VENT KIT FOR WATER HEATER. INSTALL AS PER MANUFACTURER INSTRUCTIONS.
9. METAL DUCTS TO RUN BETWEEN THE JOISTS OR THROUGH THE WEBS OF JOISTS. COORDINATE IN FIELD.
10. PROVIDE FULL SIZE RETURN AIR PLENUM AT BOTTOM OF AHU, REFER DETAIL #2 ON SHEET M-2.2 AND MODULATE RETURN AIR CFM AS SHOWN ON AIR BALANCE SCHEDULE ON SHEET M3.0.

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MECHANICAL FLOOR PLAN

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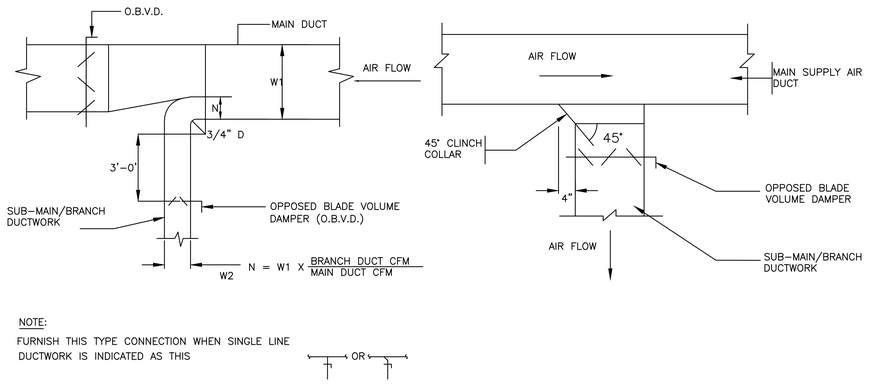


NOTE:

FURNISH THIS TYPE CONNECTION WHEN SINGLE LINE DUCTWORK IS INDICATED AS THIS

OR

1 / M2.0 SUPPLY AIR DUCTWORK SUB-MAIN/BRANCH DUCT CONNECTION

N.T.S

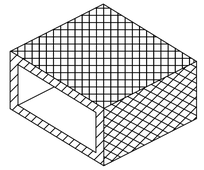


FIG. A

NOTES:

DUCTS TO BE ACOUSTICALLY LINED SHALL BE DESIGNATED BY THE SYMBOL IN FIG. "C" TO THE EXTENT OF LINING. THICKNESS SHALL BE AS SPECIFIED.

DUCTS LINED WITH ACOUSTICAL MATERIAL SHOULD BE FASTENED WITH CLIPS, ADHESIVE, OR PINS

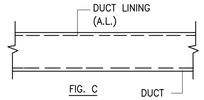


FIG. C

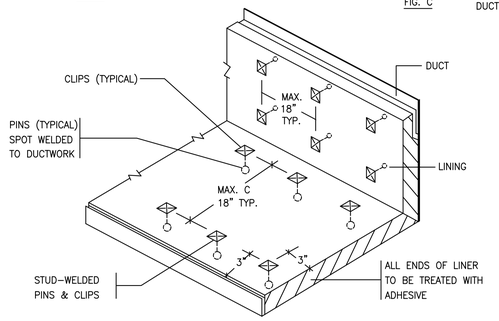
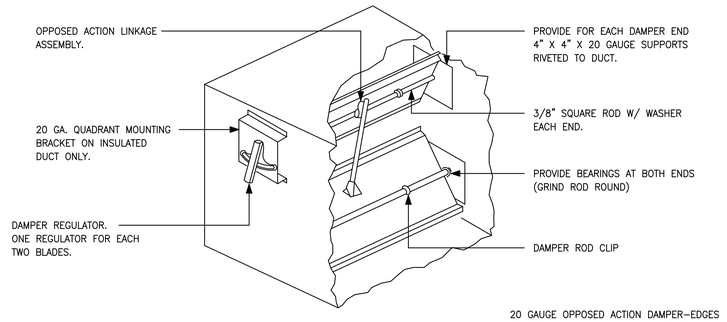


FIG. B

2 / M2.0 ACOUSTICAL TREATMENT DUCT LINING

N.T.S

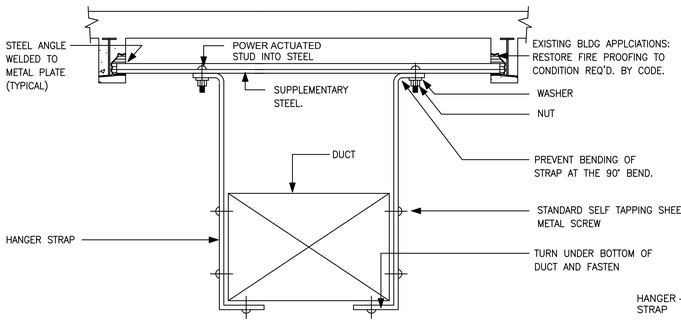


20 GAUGE OPPOSED ACTION DAMPER-EDGES CRIMPED AS SHOWN. (MAX. BLADE HTG. 12")

NOTE : 1. FOR DUCTS OVER 29" WIDE AND/OR OVER 12" HIGH.

3 / M2.0 LOW PRESSURE BALANCING DAMPER

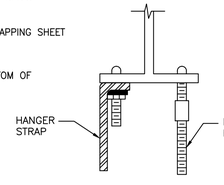
N.T.S



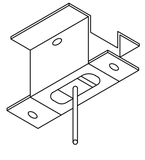
NOTES:

1. DUCTS SHALL NOT BE HUNG FROM OR SUPPORTED BY HUNG CEILING.
2. FOR ALL DUCTS, HANGERS SHALL BE TURNED UNDER AND FASTENED TO TO THE BOTTOM OF DUCT AS SHOWN ABOVE.
3. FRICTION OR CADDY CLIP ATTACHMENT TO STRUCTURE IS NOT PERMITTED.

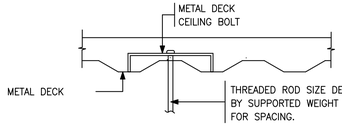
DUCT HANGER SCHEDULE		
DUCT CROSS SECTIONAL AREA	STRAP HANGER SIZE	MAX. SPACING
UNDER 2 SQ FT.	1" X 1/16"	6'-0" O.C.
2 TO 4 SQ FT.	1" X 1/8"	8'-0" O.C.
4 TO 8 SQ FT.	1" X 1/8"	6'-0" O.C.
OVER 8 SQ FT.	1" X 1/8"	4'-0" O.C.

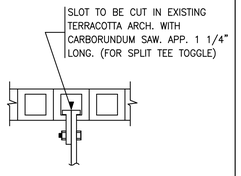


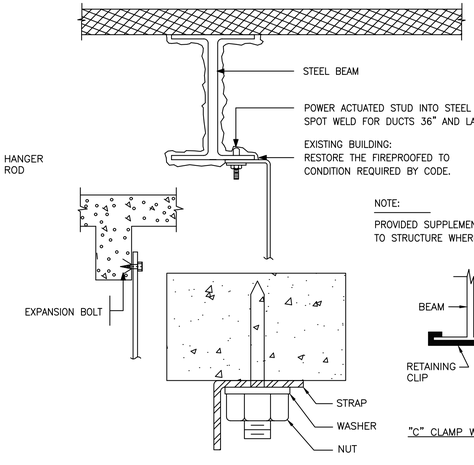
POWER ACTUATED STUDS INTO STEEL (STRUCTURE OR DECK)



MANUFACTURED CONCRETE INSERT

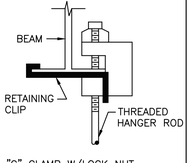






NOTE:

PROVIDED SUPPLEMENTARY ATTACHMENT TO STRUCTURE WHERE REQUIRED.

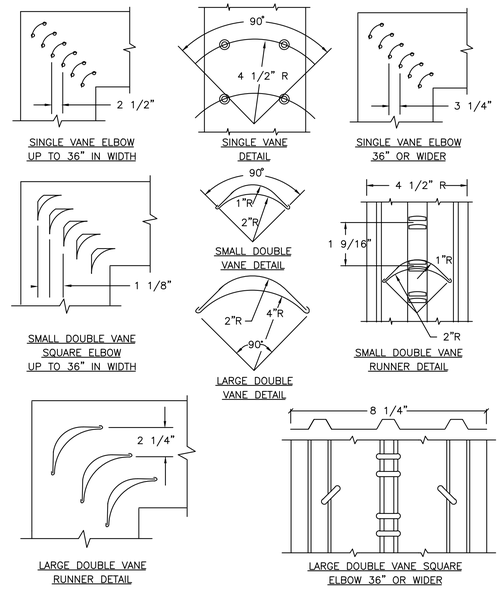


"C" CLAMP W/LOCK NUT

FLAT BAR CONCRETE INSERT

4 / M2.0 DUCT HANGING DETAILS

N.T.S



5 / M2.0 LOW VELOCITY DUCTWORK ELBOWS

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MECHANICAL DETAILS (1 OF 3)

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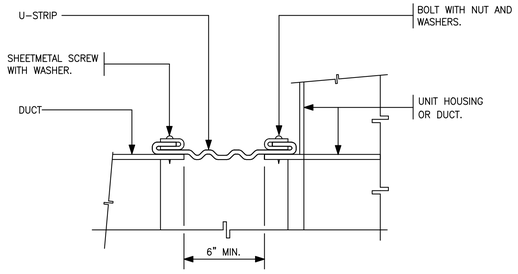
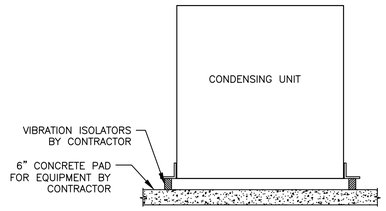
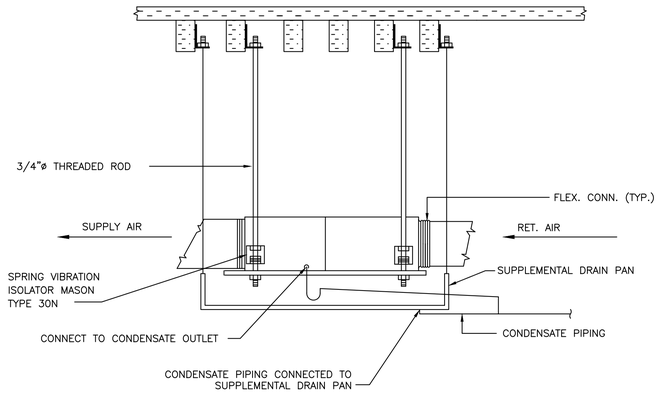


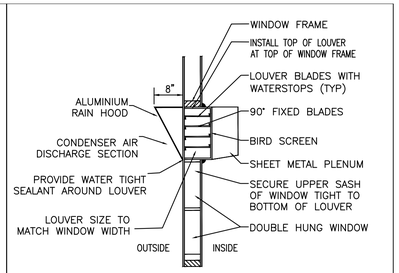
1 M2.1 FLEXIBLE CONNECTION (DUCT-EQUIPMENT)
N.T.S



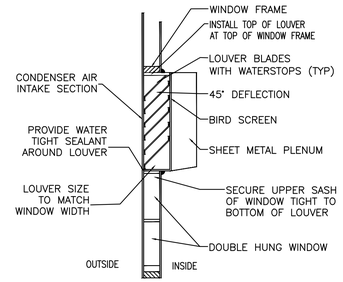
2 M2.1 FLOOR MOUNTED CONDENSING UNIT DETAIL
N.T.S



3 M2.1 A.C. UNIT INSTALLATION DETAIL
N.T.S

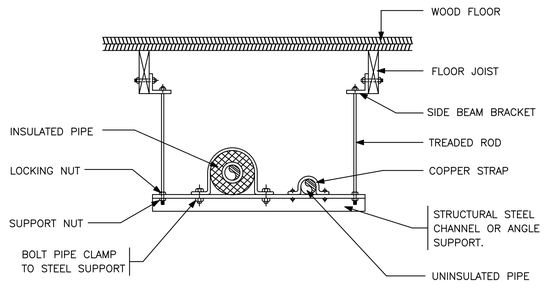


DISCHARGE LOUVER



INTAKE LOUVER

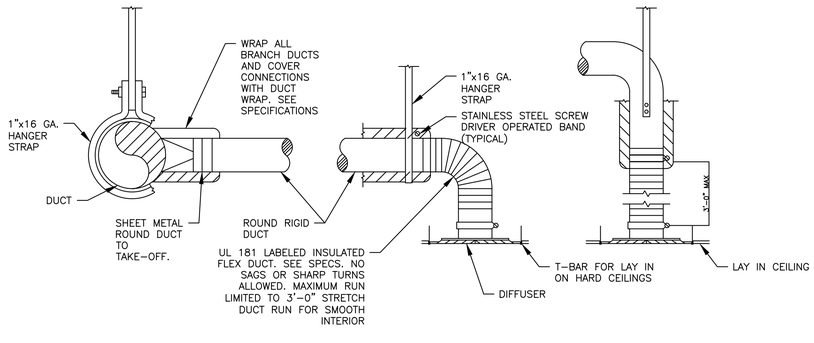
4 M2.1 LOUVER DETAIL
N.T.S



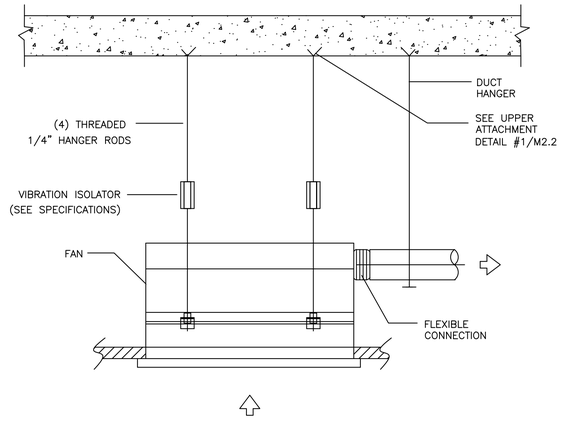
TYPICAL TRAPEZE HANGER SUPPORT

PIPE HANGER ROD AND SPACING SCHEDULE							
NOMINAL PIPE OR TUBE SIZE – INCHES	5/8	3/4	7/8	1	1 1/2	2	2 1/2
HANGER ROD SIZES INCHES	3/8	3/8	3/8	3/8	3/8	3/8	3/8
MAX. SPACING BETWEEN PIPE SUPPORTS – FEET	–	6	–	7	9	10	11
MAX. SPACING BETWEEN CU. TUBE SUPPORTS–FT.	6	6	6	6	8	9	10
NOTES : TRAPEZE HANGER SPACING SHALL BE BASED ON SPACING OF SMALLEST PIPE ON TRAPEZE. TRAPEZE SHALL BE DESIGNED WITH A FACTOR OF SAFETY OF 5 FOR CENTER OF SPAN CONCENTRATED LOAD.							

5 M2.1 METHOD OF HANGING REFRIGERANT PIPING
N.T.S



6 M2.1 TYPICAL DIFFUSER CONNECTION DETAIL
N.T.S



7 M2.1 CEILING FAN HANGING SUPPORT DETAIL
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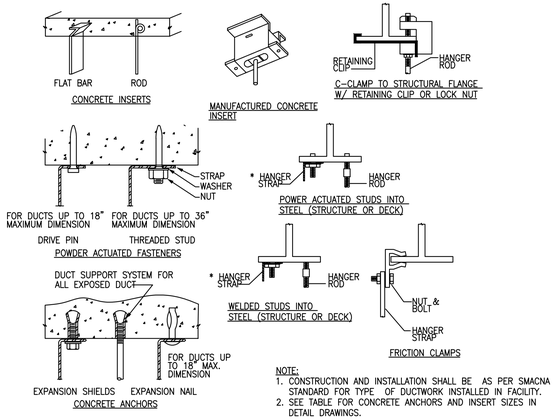
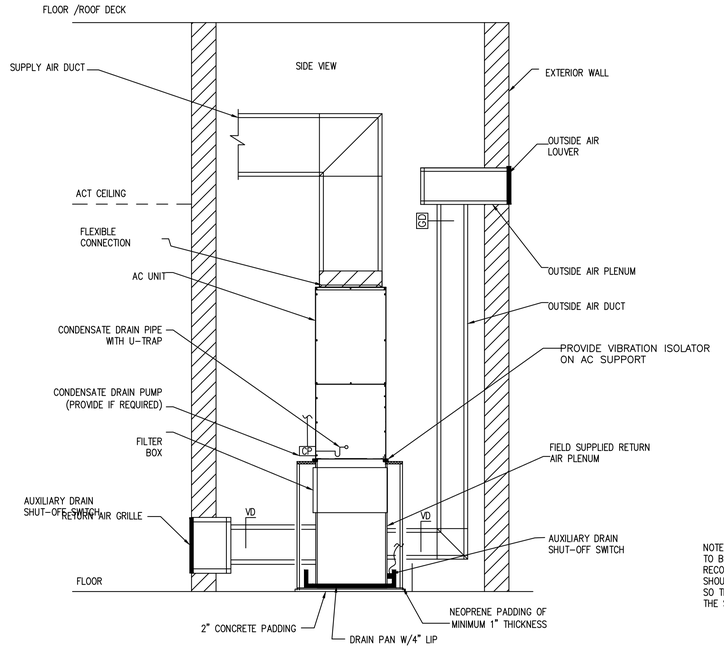


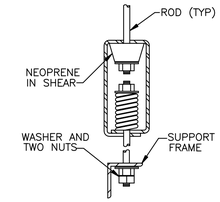
NOTE:
1. CONSTRUCTION AND INSTALLATION SHALL BE AS PER SMACNA STANDARD FOR TYPE OF DUCTWORK INSTALLED IN FACILITY.
2. SEE TABLE FOR CONCRETE ANCHORS AND INSERT SIZES IN DETAIL DRAWINGS.

1 / M2.2 UPPER ATTACHMENT METHODS OF HANGING DUCT AND EQUIPMENT DETAIL
N.T.S



NOTE: AN AUXILIARY DRAIN SHUT-OFF SWITCH TO BE INSTALLED AS PER MANUFACTURERS RECOMMENDATION. THE SHUT-OFF SWITCH SHOULD BE WIRED INTO THE CONTROL CIRCUIT SO THE OUTDOOR UNIT SHUTS DOWN SHOULD THE SWITCH DETECT WATER.

2 / M2.2 MULTI-POSITION AIR HANDLING UNIT DETAIL
N.T.S



3 / M2.2 VIBRATION ISOLATOR DETAIL
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AIR COOLED CONDENSING UNIT SCHEDULE

TAG	QUANTITY	LOCATION	INDOOR UNITS SERVED	CAPACITY (TON)	TOTAL COOLING CAP. (MBH)	COMPRESSOR TYPE	UNIT DIMENSIONS (HXLXW)	WEIGHT (LBS)	REFRIGERANT PIPING		ELECTRICAL DATA			SEER2	SOUND RATING	NOTES/ REMARKS	BASIS OF DESIGN	
									LIQUID	GAS	PH/V/HZ	MCA	MOP (A)				MAKE	MODEL
ACCU-1,2,5	3	SEE PLAN	AHU-1,2,5	4.0	48	SCROLL	35" X 33.75" X 33.75"	243	3/8"	7/8"	1/208-230/60	30	50	13.8	71	1-8	RHEEM OR EQUIVALENT	RA14AY48AJ1NA
ACCU-3	1	SEE PLAN	AHU-3	2.0	24	SCROLL	25" X 29.75" X 29.75"	163	3/8"	3/4"	1/208-230/60	17	25	14.3	71	1-8	RHEEM OR EQUIVALENT	RA14AY24AJ1NA
ACCU-4	1	SEE PLAN	AHU-4	1.5	18	SCROLL	25" X 29.75" X 29.75"	141	3/8"	3/4"	1/208-230/60	12	15	14.3	71	1-8	RHEEM OR EQUIVALENT	RA14AY18AJ1NA

NOTES:
1) UNIT SHALL HAVE TEN YEAR EXTENDED WARRANTY FOR COMPRESSORS/PARTS.
2) PROVIDE COMPRESSOR CYCLE PROTECTOR.
3) 4" CONCRETE PADS FOR CONDENSER MOUNTING TO BE PROVIDED BY MECHANICAL CONTRACTOR .
4) OUTDOOR REFRIGERANT LINESET TO BE WRAPPED IN UV RESISTANT, FIRE RATED, AND ANTI-MICROBIAL INSULATION PROTECTION BASED ON AIREX-FLEX GUARD OR EQUAL.
5) OUDOOR CONDENSING UNITS TO BE LOCATED WITH PROPER CLEARANCES AND MUST PREVENT RE-CIRCULATION OF AIR. COORDINATE WITH MANUFACTURER AND ARCHITECT.
6) AIR CONDITIONER UNIT SHALL NOT PRODUCE NOISE LEVELS IN EXCESS OF 42 dB FOR A SINGLE AIR CIRCULATING DEVICE AND 45 DECIBELS FOR THE CUMULATIVE NOISE LEVEL OF MULTIPLE AIR CIRCULATING DEVICES AS MEASURED 3 FEET FROM THE NOISE SOURCE AT AN OPEN DOOR OR WINDOW OF A NEARBY RESIDENCE.
7) CONTRACTOR SHALL PROVIDE A LONG LINE SET FOR REFRIGERANT PIPING IN THE EVENT THAT TOTAL REFRIGERANT LENGTH EXCEED THE MANUFACTURER'S STANDARD RECOMMENDED LENGTH.
8) REFRIGERANT R-454B SHALL BE PROVIDED.

AIR HANDLING UNIT (FURNACE WITH EVAPORATOR COIL) SCHEDULE

TAG	QUANTITY	AREA SERVED	TON	COOLING (MBH)	SUPPLY AIR (CFM)	OUTDOOR AIR (CFM)	ESP (IN. OF WC)	DIMENSIONS (HxWxD) (FURNACE & EVAPORATOR COIL) (IN.)	REFRIGERANT PIPE SIZE		DRAIN	GAS HEATING DATA			ELECTRICAL DATA			WEIGHT	BASIS OF DESIGN		
									LIQUID	SUCTION		INPUT (MBH)	OUTPUT (MBH)	THERMAL EFFICIENCY	VOLT/PH/HZ	MCA	MOP (A)	(LBS)	MAKE	MODEL NO.	
																				FURNACE	EVAPORATOR COIL
AHU-1,2	2	SEE PLAN	4.0	48	1600	300	1.0	29 X 17.5 X 34 & 28 X 25 X 21	3/8"	7/8"	3/4"	70	66.5	95%	115/1/60	17	20	218	RHEEM OR EQUIVALENT	R951V0705A21M4SCAP	RCFY4821STANM
AHU-3	1	SEE PLAN	2.0	24	990	140	1.0	29 X 17.5 X 34 & 20 X 17.5 X 21	3/8"	3/4"	3/4"	42	39.9	95%	115/1/60	11	15	166	RHEEM OR EQUIVALENT	R951V0403A17M4SCAP	RCFY2417STANM
AHU-4	1	SEE PLAN	1.5	36	990	40	1.0	29 X 17.5 X 34 & 20 X 17.5 X 21	3/8"	3/4"	3/4"	42	39.9	95%	115/1/60	11	15	166	RHEEM OR EQUIVALENT	R951V0403A17M4SCAP	RCFY2417STANM
AHU-5	1	SEE PLAN	4.0	48	1600	230	1.0	29 X 17.5 X 34 & 28 X 25 X 21	3/8"	7/8"	3/4"	70	66.5	95%	115/1/60	17	20	218	RHEEM OR EQUIVALENT	R951V0705A21M4SCAP	RCFY4821STANM

NOTES/ACCESSORIES:-
1) SUPPLY AIR CFM BASED ON HIGH SPEED. PROVIDE VARIABLE AIRFLOW ADJUSTMENT CONTROL FOR ALL UNITS.
2) REFRIGERANT R-454B SHALL BE PROVIDED. PROVIDE REFRIGRANT LEAK DETECTOR IN THE UNIT.
3) PROVIDE ALL MERV-8 FILTERS AT FAN INLET, MOUNTING BRACKETS, SPRING MOUNTED VIBRATION ISOLATIORS AND OTHER ASSOCIATED ACCESSORIES AS REQUIRED FOR PROPOER OPRATION OF THE UNIT.
4) ALL REFRIGERANT PIPING TO BE SIZED AS PER MANUFACTURERS RECOMMENDATIONS.
5) CONTRACTOR SHALL PROVIDE A LONG LINE SET FOR REFRIGERANT PIPING IN THE EVENT THAT TOTAL REFRIGERANT LENGTH EXCEEDS THE MANUFACTURER'S STANDARD RECOMMENDED LENGTH.
6) PROVIDE DRAIN PAN WITH WATER LEAK DETECTOR TO SHUT DOWN AHUs.
7) PROVIDE DISCONNECT SWITCH & NON-POWERED GFI OUTLET.
8) PROVIDE ACCESS PANELS FOR THE UNITS.
9) PROVIDE CONDENSATE PUMP IF REQUIRED.

FAN SCHEDULE

UNIT TAG	QUANTITY	FAN DATA				ELECTRIC DATA			SOUND	DIMENSIONS (L x W x D)	WEIGHT (LBS)	INTERLOCKED WITH	BASIS OF DESIGN		NOTES
		AIRFLOW (CFM)	E.S.P (IN OF W.G.)	SPEED (RPM)	TYPE	V/PH/HZ	MCA (A)	MOCP (A)	(SONES)	(IN.)			MANUFACTURER	MODEL	
EF-1, 2, 3	3	70	0.25	700	CEILING	115/1/60	0.2	15	1.3	14 x 12 x 7	15	RESTROOM LIGHT	GREENHECK OR EQUIVALENT	SP-B90	1-5

NOTES:
1) PROVIDE FACTORY MOUNTED DISCONNECT SWITCH.
2) PROVIDE THERMAL OVERLOAD PROTECTION, BACKDRAFT DAMPER.
3) BACKDRAFT DAMPER.
4) PROVIDE ALL NECESSARY ACCESSORIES AS PER MANUFACTURER'S RECOMMENDATIONS.
5) FAN SPEED SHALL BE EASILY FIELD ADJUSTABLE.

AIR TERMINAL SCHEDULE

BASIS OF DESIGN: TITUS OR EQUIVALENT

TAG	TYPE	MATERIAL	CFM RANGE	DIMENSION (IN.)	MODEL NO.	MAX NC (dBA)
CDS-1	SQUARE PLAQUE FACE CEILING SUPPLY DIFFUSER WITH ROUND NECK, WITH ADJUSTABLE OPPOSED BLADE DAMPER	ALUMINUM	SEE PLAN	24X24	TMS	20
CDS-2	SQUARE PLAQUE FACE CEILING SUPPLY DIFFUSER WITH ROUND NECK, WITH ADJUSTABLE OPPOSED BLADE DAMPER	ALUMINUM	SEE PLAN	12X12	TMS	20
SG-1	LOUVERED SUPPLY GRILLE (PROVIDE WITH OPPOSED BALDE DAMPER)	ALUMINUM	SEE PLAN	SEE PLAN	300FL	20
RG-1	LOUVERED RETURN GRILLE (PROVIDE WITH OPPOSED BALDE DAMPER)	ALUMINUM	SEE PLAN	SEE PLAN	350RL	20

NOTES:
1) ALL GRILLES : CONTRACTOR SHALL COORDINATE WITH LATEST ARCHITECTURAL REFLECTED CEILING PLANS PLANS TO ENSURE PROPER AIR DEVICE BORDER SELECTION.
2) COORDINATE COLOR/FINISH WITH ARCHITECT.
3) DIFFUSSERS SHALL BE 4-WAY BLOW UNLESS OTHERWISE INDICATED ON PLANS.
4) FOR DIFFUSER NECK SIZE:
15" DIA: 536-750 CFM
14" DIA: 400-535 CFM
12" DIA: 276-400 CFM
10" DIA: 176-275 CFM
8" DIA: 101-175 CFM
6" DIA: 0-100 CFM

AIR BALANCE SCHEDULE

UNIT	AREA SERVED	SUPPLY AIR (CFM)	OUTSIDE AIR (CFM)	RETURN AIR (CFM)	EXHAUST AIR (CFM)	BUILDING PRESSURE (CFM)
AHU-1	SEE PLAN	1600	300	1300	0	+300
AHU-2	SEE PLAN	1600	300	1300	0	+300
AHU-3	SEE PLAN	990	140	850	0	+140
AHU-4	SEE PLAN	990	40	950	0	+40
AHU-5	SEE PLAN	1600	230	1370	0	+230
EF-1	RESTROOM	0	0	0	70	-70
EF-2	RESTROOM	0	0	0	70	-70
EF-2	RESTROOM	0	0	0	70	-70
	TOTAL:	6780	1010	5770	210	**800 CFM**
	BUILDING PRESSURE:	.....				**POSITIVE**

VENTILATION CALCULATION AS PER FMC 2023, 8TH EDITION

ROOM NUMBER	ROOM NAME	AREA	NUMBER OF PEOPLE/1000 SQFT AS PER 2023 FMC	NUMBER OF PEOPLE AS PER 2023 FMC	NO. OF CHAIR	FINAL PEOPLE NO.	OUTSIDE AIR CFM AS PER 2023 FMC		CALCULATED OA CFM	PROVIDED OAI	EXHASUT AIR CFM/SQFT OR CFM/FIXT. AS PER 2023 FMC	EXHASUT AIR REQUIRED (CFM)	EXHASUT AIR PROVIDED (CFM)	REMARK
							CFM/PERSON	CFM/SQ.FT						
1	ENTRY	60	0	0	0	0	0	0	0		0	0	0	-
2	RR	43	0	0	0	0	0	0	0		70	70	70	2023 FMC - TOILET
3	RR	43	0	0	0	0	0	0	0		70	70	70	2023 FMC - TOILET
4	SANCTUARY	1470	120	177	128	128	5	0.06	728		0	0	0	2023 FMC - PLACES OF RELIGIOUS WORSHIP
5	SOUND	28	5	1	0	1	5	0.06	7		0	0	0	2023 FMC - OFFICE SPACES
6	AC	32	0	0	0	0	0	0.12	4		0	0	0	2023 FMC - STORAGE ROOMS
7	HALL	86	0	0	0	0	0	0.06	5		0	0	0	2023 FMC - CORRIDOR
8	RR	38	0	0	0	0	0	0	0	**1010**	70	70	70	2023 FMC - TOILET
9	OFFICE	167	5	1	0	1	5	0.06	15		0	0	0	2023 FMC - OFFICE SPACES
10	PASTOR	107	5	1	0	1	5	0.06	11		0	0	0	2023 FMC - OFFICE SPACES
11	HALL	86	0	0	0	0	0	0.06	5		0	0	0	2023 FMC - CORRIDOR
12	FELLOWSHIP HALL	570	120	69	38	38	5	0.06	224		0	0	0	2023 FMC - MULTIPURPOSE ASSEMBLY
13	STORAGE	28	0	0	0	0	0	0.12	3		0	0	0	2023 FMC - STORAGE ROOMS
14	AC	12	0	0	0	0	0	0.12	1		0	0	0	2023 FMC - STORAGE ROOMS
	GRAND TOTAL	2770				169			1004				**210**	

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System Component Selection Summary

Primary

System Name: ACCU-1,2&3

System Type: Constant Volume (CV)
Number of Zones 1
Number of Rooms 6

Component	Quantity
Cooling Coils	1
Heating Coils	1
Fans	1

Cooling Coils

Coil Location			Coil Selection at Design						Airflow Conditions at Design						Water Flow Conditions		
System	Zone	Type	Sizing Method	Time of Peak Mo/D/Hr	Total capacity (tons)	Sensible capacity (MBh)	Vent Load (MBh)	Ov/undr sizing (MBh)	Airflow (cfm)	Vent (cfm)	Enter DB/WB (°F)	Leave DB/WB (°F)	Enter DB/WB (°F)	Leave DB/WB (°F)	Flow (gpm)	Enter Temp (°F)	Leave Temp (°F)
SCC-1 SANCTUARY		DX	Peak		10.0	120.1	81.0	38.2	N/A	2,358	740	82.1	67.67	50.7	50.72	N/A	N/A	N/A

*Values do not include effects of plenum loads, heat exchangers such as evaporative cooling devices and similar components.

Heating Coils

Coil Location			Coil Selection at Design					Airflow Conditions at Design				Water Flow Conditions		
System	Zone	Type	Sizing Method	Time of Peak Mo/D/Hr	Total capacity (MBh)	Vent Load (MBh)	Ov/undr sizing (MBh)	Airflow (cfm)	Vent (cfm)	Enter DB (°F)	Leave DB (°F)	Flow (gpm)	Enter Temp (°F)	Leave Temp (°F)
SHC-1 SANCTUARY		Electric	Peak	1/21 24:00	94.9	36.2	N/A	2,358	740	57.8	95.0	N/A	N/A	N/A

System Name: ACCU-4

System Type: Constant Volume (CV)
Number of Zones 1
Number of Rooms 5

Component	Quantity
Cooling Coils	1
Heating Coils	1
Fans	1

Cooling Coils

Coil Location			Coil Selection at Design						Airflow Conditions at Design						Water Flow Conditions		
System	Zone	Type	Sizing Method	Time of Peak Mo/D/Hr	Total capacity (tons)	Sensible capacity (MBh)	Vent Load (MBh)	Ov/undr sizing (MBh)	Airflow (cfm)	Vent (cfm)	Enter DB/WB (°F)	Leave DB/WB (°F)	Enter DB/WB (°F)	Leave DB/WB (°F)	Flow (gpm)	Enter Temp (°F)	Leave Temp (°F)
SCC-1 OFFICE		DX	Peak		1.2	14.0	11.5	2.1	N/A	444	40	77.3	63.12	53.7	52.18	N/A	N/A	N/A

*Values do not include effects of plenum loads, heat exchangers such as evaporative cooling devices and similar components.

Heating Coils

Coil Location			Coil Selection at Design					Airflow Conditions at Design				Water Flow Conditions		
System	Zone	Type	Sizing Method	Time of Peak Mo/D/Hr	Total capacity (MBh)	Vent Load (MBh)	Ov/undr sizing (MBh)	Airflow (cfm)	Vent (cfm)	Enter DB (°F)	Leave DB (°F)	Flow (gpm)	Enter Temp (°F)	Leave Temp (°F)
SHC-1 OFFICE		Electric	Peak	1/21 24:00	13.0	2.0	N/A	444	40	67.9	95.0	N/A	N/A	N/A

System Name: ACCU-5

System Type: Constant Volume (CV)
Number of Zones 1
Number of Rooms 3

Component	Quantity
Cooling Coils	1
Heating Coils	1
Fans	1

Cooling Coils

Coil Location			Coil Selection at Design						Airflow Conditions at Design						Water Flow Conditions		
System	Zone	Type	Sizing Method	Time of Peak Mo/D/Hr	Total capacity (tons)	Sensible capacity (MBh)	Vent Load (MBh)	Ov/undr sizing (MBh)	Airflow (cfm)	Vent (cfm)	Enter DB/WB (°F)	Leave DB/WB (°F)	Enter DB/WB (°F)	Leave DB/WB (°F)	Flow (gpm)	Enter Temp (°F)	Leave Temp (°F)
SCC-1 FELLOWSHIP HALL		DX	Peak		4.1	49.4	30.8	10.3	N/A	974	230	79.7	67.15	50.7	50.12	N/A	N/A	N/A

*Values do not include effects of plenum loads, heat exchangers such as evaporative cooling devices and similar components.

Heating Coils

Coil Location			Coil Selection at Design					Airflow Conditions at Design				Water Flow Conditions		
System	Zone	Type	Sizing Method	Time of Peak Mo/D/Hr	Total capacity (MBh)	Vent Load (MBh)	Ov/undr sizing (MBh)	Airflow (cfm)	Vent (cfm)	Enter DB (°F)	Leave DB (°F)	Flow (gpm)	Enter Temp (°F)	Leave Temp (°F)
SHC-1 FELLOWSHIP HALL		Electric	Peak	1/21 24:00	35.5	11.2	N/A	974	230	61.3	95.0	N/A	N/A	N/A

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